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ABSTRACT

Sixteen papers from a workshop on computer applications sponsored by the University of Cape Town (South Africa) School of Librarianship are presented in this volume: (1) "Introduction to the Use of Information Technology" (Sue Bleimschein); (2) "Searching Remote Databases" (Steve Rossouw); (3) "SABINET [South African Bibliographic and Information Network]: Description and Development: A Brief Overview" (Ilse van Niekerk); (4) "Introduction to Integrated Library Systems" (Margaret Lodder); (5) "Overview of an Integrated Library System: URICA" (Kerry Stephenson); (6) "Serials Control: EBSCO" (W. Philip van Zwam); (7) "Introduction to Software Packages" (Margaret Lodder); (8) "Building Your Own Database" (Yvonne Blomkamp); (9) "Indexing Techniques in Database Systems" (Johan van Wyk); (10) "Applications of Telecommunications and Networking" (Sue Bleimschein); (11) "SAPONET: Description and Development" (Americo da Silva); (12) "Local Area Networks" (Pieter S. Kritzinger); (13) "Choosing a Computerized System" (Margaret Lodder); (14) "Requirements Specifications for Library Systems" (Margaret Lodder); (15) "Implementation of a Computerized System" (Kerry Stephenson); and (16) "Strategy for Development: A Personal Account" (Marlene Sachs). A summary of the welcoming address by Deon Kesting and the text of closing comments by Gretchen Smith are included as well as a list of participants, a list of vendors, a workshop program, a 50-item bibliography, and a glossary. (MES)

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COMPUTER APPLICATIONS IN INFORMATION SYSTEMS

Proceedings of a Workshop held on 26-27 November 1985

Compiled and edited by Sue Bleimschein

Workshop arranged by
University of Cape Town School of Librarianship
Special Libraries Interest Group
South African Institute for Librarianship and Information Science, Western Cape Branch.

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INTRODUCTION

Sue Bleimschein

The series

This Workshop, "Computer Applications in Information Systems", was the first in the UCT School of Librarianship Continuing Education Series. The concept of continuing education is not new to the School, though, as short courses were offered in 1941 and 1947. However, we are now faced with such a rapid rate of change that lifelong education has to be considered a necessity, rather than a luxury. One basic skill or qualification will seldom suffice for the entire duration of one's career. Changing jobs or being professionally inactive for a period can mean that one is faced with a demand for new skills.

The average working professional has little time, and seldom the opportunity, to keep up with the professional literature. Even if the literature is scanned regularly, the working librarian requires a framework onto which this new information may be built; guidance may be needed when traversing unfamiliar territory; and, sometimes, special equipment may be necessary.

This Workshop sought to introduce Information Technology (IT) to the participants, as IT is making such an impact on our profession currently, but this series, as a whole, will not be devoted exclusively to this subject.

Courses on any subject will attempt to achieve at least three things : (a) to introduce participants to the subject matter, through overviews, bibliographies and glossaries, making them aware of the various aspects of the topic; (b) to provide opportunities for talks by and discussions with specialists in particular fields; and (c) to provide practice or exercise so that participants become fluent in new skills and techniques. The format and duration of the short courses will differ according to subject. Certificates are issued to participants stating that they attended these courses.

The Workshop

Two factors combined to result in great enthusiasm for this particular Workshop : the general need for continuing education, as indicated above, and, in particular, the need for education and training in IT. Whether one is for or against technology, whtether one becomes technophreniac or technophobic, information managers today must have at least a nodding acquaintance with IT.

The Workshop was attended by 140 librarians and information professionals for libraries and information centres of all types, as well as professionals ans business peiple from outside the field of library and information science. They came from the Western Cape and the rest of South Africa, and from as far afield as Perth, Australia, and they represented all levels of professional and technological experience.

The objectives of this Workshop were : to introduce participants to the varied applications of IT; to describe hardware, software, file organisation, database management and communications systems; to demonstrate a wide range of IT, and to provide participants with an opportunity for hands-on experience. This indicates the extensive scope of the Workshop.

The variety of libraries represented, and the level and nature of experience of the participants also had to be considered when designing the programme. The scope of the Workshop should be broad so that a unique opportunity could be provided for participants to view the full range of state-of-the-art IT available in this country. It was essential to ensure that there would be something of direct relevance for all library types represented. Theoretically, nearly all the technology described and exhibited could be used in any type of library or inofrmation centre. Practically, considerations of cost and frequency of use meant that certain types of technology would be of more value in some environments than others.

It seemed to be useful to assume little or no knowledge of IT on the part of the participants. Some would almost certainly have knowledge of some areas. The opportunity would be provided for these people to supplement their expertise. There would, however, be other areas in which these same individuals would have had very little experience, so, irrespective of their original level of expertise, all participants should gain in some measure form the final programme design.

In order to reach the stated objectives, and bearing the above factors in mind, five approaches to the topic were adopted:

- On registration, participants were provided with pre-course reading. This was intended as an introduction to the subject, particularly for those who had absolutely no previous knowledge. It was also intended as a brief overview for those who had done some reading in the field. Supplementing this were brief bibliographies and a glossary. The reading lists could be consulted where participants felt the need to explore a topic in greater depth; the glossary attempted to make sense of the often confusing terminology and "buzzwords", and to highlight the meaning of key concepts in IT.

- Specialists were invited to describe and discuss various aspects and types of IT in formal lectures. These speakers included librarians, information professionals, consultants, academics and vendors of systems.

- Long mealtime breaks were devoted to informal conversation and questioning.

- During the late afternoon and early evening, participants could watch demonstrations and explore their own skills on the equipment. A wide range of the latest IT was exhibited.

- Finally, to bring it all together, participants were presented with a case study to solve.

This publication may also add to the total experience.

As Sue Bleimschein (née Myburgh) indicates in her introductory talk, there are at least three ways in which the storage, processing and communication abilities of IT may be used in libraries and information centres:

- to supplement the stock of information sources (eg videodisc, videotex);
- to process and control the information generated by the library (eg OPACs, integrated library systems, wordprocessing, etc.); and
- to access information stored remotely in electronic form (eg bibliographic databases, SABINET, and electronic publishing).

The latter two aspects enjoyed the most attention. The talks were arranged in four main areas:

- The first area, which included speakers Steve Rossouw of MRC Institute of Biomedical Communication, and Ilse van Niekerk of SABINET, described access to remote databases - both national and international.
- The second area was addressed by Margaret Lodder of the CSIR, Kerry Stephenson of URICA, Yvonne Blomkamp of the Energy Research Institute at UCT, Philip van Zwam of EBSCO and Johan van Wyk of RAU. This covered in-house library systems and databases, ranging from large integrated library systems and smaller micro-based databases, as well as serials subscription facilities.
- Telecommunications and networking, essential when accessing or linking databases, comprised the third area. This topic was addressed by Sue Bleimschein of the School, Americo da Silva of SAPONET, and Prof Pieter Kritzinger of the UCT Department of Computer Science.
- The last was the computerisation process. Margaret Lodder, Kerry Stephenson and Marlene Sachs discussed choosing and implementing a computerized system. The case study which followed highlighted the points made earlier by all these speakers, and participants were invited to draw the information and experience of the previous two days into one coherent whole.

The papers which follow are presented in this order.

Several organisations generously assisted in making this Workshop a reality and a success. We would like to thank the Council for Education and Research, of the South African Institute for Librarianship and Information Science, for their financial support. Old Mutual did the artwork and printing of our flyers and provided us with registration packs. We acknowledge this generous contribution with gratitude. We are also grateful for the enthusiasm of, and co-operation between, the School of Librarianship, University of Cape Town, the Special Libraries Interest Group and the Western Cape Branch of SAILIS.

Last and certainly not least, we would like to thank all the speakers, and the suppliers who made themselves available to demonstrate their equipment.

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WELCOMING ADDRESS

Deon Kesting

(The following is a summary of the address given by Prof J G Kesting, Director of the School of Librarianship, University of Cape Town, to welcome participants. - SEB)

Prof J G Kesting extended a warm welcome to the nearly 160 Workshop participants and lecturers on behalf of the UCT School of Librarianship. The wide range of library types represented by the participants was commented on. These included special libraries, information centres, university and technikon libraries, public and national libraries, the Library of Parliament, national museums and education libraries. Systems analysts and programmers, and representatives of industry were also present.

Kesting paid tribute to the organisations and individuals who organised the Workshop. These included the Special Libraries Interest Group, the Western Cape Branch of SAILIS, and the SAILIS Council for Education and Research. The great spirit of cooperation existing between these bodies contributed greatly to the success of the Workshop. He also thanked the speakers, such as acknowledged experts Margaret Lodder, Ilse van Niekerk and Steve Rossouw, who were willing to share their expertise. Sue Bleimschein was thanked for her initiative and enthusiasm in organising the Workshop. The vendors and demonstrators were also not excluded.

Mentioning the early beginnings of continuing education courses held by the School, Kesting elucidated the objectives of continuing education. These were threefold, in his view.

- Firstly, continuing education has a refresher function, which is to enable librarians and information workers to keep abreast of change, with regard to techniques, attitudes and viewpoints, as well as ideologies.
- Secondly, continuing education has a complementary function in that it complements the formal teaching and research programmes which lead to the award of qualifications.
- Thirdly, continuing education has a community function, in terms of facilitating interaction between the various members of the information community.

Kesting then took a retrospective look at computerisation in South Africa over the previous 25 years, mentioning, for example, the programme at the Council for Scientific and Industrial Research (CSIR), which provided for serials control and SDI services. Several new universities were established during the affluent 1960's, amongst them the Rand Afrikaans University (RAU) and the University of Port Elizabeth (UPE). The former adopted a bold pioneering approach to automation, while the latter was rather more cautious.

During 1968 and 1969 great strides were made. At the SAILIS Conference in 1968 the Division for University and Special Libraires devoted their programme to comperisation, and several articles (inter alia those by Taylor and Boshoff) appeared in South African Libraries.

The "mechanisation" of the South African National Bibliography (SANB) began in 1969, and 1970 saw the informal beginning of the MARC Working Group (MWG). This was appointed by the National Library Advisory Council (NLAC). The MWG reached its ultimate goal with the formation of the South African Bibliographic and Information Network (SABINET) which began services in 1983. Margaret Lodder and Ilse van Niekerk made major contributions here.

In 1972 the Northern Transvaal Branch of SAILIS held a seminar on "Biblioteek-meganisasie" (The mechanisation of libraries). Kesting's contribution, a talk entitled "The historical development of computers, which described the role of computers in libraries from the 1972 vantage point, now seems strangely dated in some respects, and quite modern in others.

In this talk, Kesting had summarised what developments he expected in the forseeable future. Some of the points he made at that time were:

- The level of technological hardware capacities will continue to eclipse our ability to design matching software.
- Cost-effectiveness of isolated institutional applications will remain in a precarious state. Therefore there will be an increasing need for inter-institutional cooperation, coordination and networking, to increase viability and effectiveness.
- Vastly superior and sophisticated approaches to information processing will emerge. These will include subject and content analysis and bibliographic control, both of which will demonstrate characteristics of user-friendliness, pleasing aesthetics and natural language.
- The intellectually creative input of librarians is a prerequisite for enhanced bibliographic and information processing. This presupposes a transformation in our attitudes.
- There will be a heightened need for compatability between hardware and software to facilitate coordination and continuity of information/bibliographic systems.
- Online, realtime, interactive means of bibliographic communication will become increasingly important. (Note that batch processing was then the order of the day).
- There will be greater awareness of the need for research and development to precede implementation.

Kesting stated that he feels it is equally important for librarians to know what computerisation can do to enhance their services as to know what computers, by their very nature, cannot do. Computerisation is here seen as the advanced end-result of the rational faculty of humans. This implies that whatever the nature of the intellectual problem, it is logically conceivable, by inference and analogy, that it can be solved more rapidly, accurately, undistractedly and economically by computers.

However, the computer cannot deal directly with issues related to man's never-ending, ever-receding quest for the grasp of ultimate reality. This quest is promoted by the convergence of interdependent faculties, namely reason (as logic); intuition (as immediate knowing); sensation (as understanding of the three-dimensional world); and feeling (as emotion). The quest, or success thereof, depends on whole judgement involving all faculties. This explains in measure the spontaneous, idiosyncratic information of poetry and religion, and the expression of ultimate values. One must be aware that the faculties of reason, calculation and memory can be fallible, and it is these, mainly intellectual and mechanical chores, which are augmented by computers. Used wisely and appropriately, however, computers should help us become more efficient librarians.

INTRODUCTION TO THE USE OF INFORMATION TECHNOLOGY

Sue Bleimschein

The title of this Workshop, "Computer Applications in Information Systems", indicates the wide variety of uses of Information Technology (IT). Many technologies are information-related, as they deal with the capture, storage, processing, display and communication of information. Not the least of these technologies manifests itself in the form of books. The term "Information Technology", however, relates specifically to those technologies which employ computers and the new telecommunications facilities.

The emphasis here is on explaining the varied applications of IT, rather than giving technical descriptions of how IT works. The full range of libraries and information centres, from museums (storing artefacts), through archives, national, academic, research, school, public and special libraries, are able to use IT to a greater or lesser extent. This Workshop sets out to explore this range of uses. It is the newer, and probably the less familiar, technologies and equipment that will be discussed and exhibited over the next two days. You may then determine what configurations will best solve the problems of, or enhance, your particular situation.

A certain amount of pressure to use IT is being brought to bear upon us by our colleagues, our users and the professional literature. Librarians and information professionals are being exhorted, in the words of Bearman, (1,p2) "to catch up, keep up and lead". This is a challenge especially when we realize how rapidly the field is developing - in scale, range and impact. Some idea of the scale and range is given by Burns when he points out:

> "The development of information technology has progressed, in terminology at least, from Electronic Data Processing, through Information Systems, to Knowledge Engineering. Implied by this change in nomenclature is a progression from the mere manipulation of large amounts of data, to the structuring of data to give information to the user, and, in the future, actual deductive powers and reasoning." (4, p. 15).

The "deductive powers and reasoning" cannot be too far in the future now, with the promised development of fifth generation computers, as well as the experimental work already done in the field of artificial intelligence and expert systems. Yaghmai and Maxin define expert systems as "intelligent computer applications that use data, a knowledge base, and a control mechanism to solve problems of sufficient difficulty that significant human expertise is necessary for their solution." (9, p. 297).

The dramatic development and expansion of the computer's abilities is clear. From doing straightforward calculation and "number-crunching", the computer is now able to simulate human intelligence, falling short, perhaps reassuringly, of independent creative acts.

The use of IT is libraries and information centres (and elsewhere) has also been escalating. It is hard to believe that as recently as 1973 there were only 2 database suppliers, providing access to a grand total of six databases. (nowadays we have access to around 3 000). Berry (3, p.48) reports that

by 1984 at least 190 000 microcomputers were being used by American libraries - many of which are for public use. Matthews (7,p.31) indicates that by the end of 1984, 769 turnkey automated library systems had been installed; 42 library developed systems and 231 library specific microcomputer-based products were available, and 1 884 libraries had purchased COM catalogues.

This indicates some of the use in the United States. What about South Africa? Musiker indicates that there is growth in the use of IT in South African Libraries too. The following points were made in a recent article of his (8, p.68):

> "The 'new technology' is making its mark in South African libraries... Progress in library computerization has been remarkable. No less than 31 libraries (the majority academic) are operating computerized systems. They range from dedicated minicomputers to large installations linked to the parent institution's mainframe computer, with a discernable recent trend towards the use of dedicated systems. There has also been a marked preference for the use of commercially marketed software packages, in contrast to the self-devised systems which were a feature of earlier years."

Perhaps one should be more specific at this point about the types of IT which are useful in libraries and information centres. Librarians and information managers are concerned with essentially three types of information, published or unpublished. The quantity, quality, value and cost of information are important things for librarians to consider. Computers and telecommunications technologies maybe used to process, store, control and access information, and these technologies are introduced for primarily two reasons: to save costs and increase service to users. IT can be used to reach these objectives with all three types of information.

Firstly, librarians and information managers deal with that information which forms the stock on which they draw in order to satisfy users' needs. Examples of IT which are useful in this category include teletext, videotex, video discs and cassettes, sound recordings (particularly on compact disc), microform, (including COM), electronic publishing (text distributed in electronic mode via telecommunications), Kurzweil and other voice synthesizer machines, software (particularly for microcomputers) and holograms (in particular laser projections).

Some technologies (or computer-produced formats) are better than others for information storage and retrieval - "better" in the sense that they are more compact or more complete (conveying a fuller message). They may also be cheaper. A hologram, for instance, is wonderful for displaying representations of three dimensional objects. Videodiscs store images, text and voice extremely compactly, and many are already available for less than $100. Some examples are those produced by the Library of Congress (art prints and movies, and the MARC database)and the Boston Museum of Fine Art, the Museums of America, the National Gallery of Art, Washington, and the National Library of Medicine (prints and photographs). Also just completed or in preparation are the Encyclopaedia of Birds, College USA and the Emperor I China project.

Using a microcomputer with wordprocessing and database management software, it is relatively straightforward to create local community information fiels, guides to the library, bibliographic instruction courses, and thesauri. BELTEL, an interactive videotex system is now available, as well as several forms of electronic publishing (about which more later).

We have an obligation to provide information to our users in whatever shape, manner or form may be appropriate or available, to use a Runyonesque phrase. Perhaps we equally have an obligation to promote these newer formats.

Secondly, there is that information which controls and documents the activities of the library or information centre as an organization (as well as controlling and documenting the "stock information" described above). Examples of IT here are typewriters, telephones, telex, dictating machines, microform readers, calculators, reprographic equipment, facsimile telefax, automatic addressing machines, paging systems and intercom, word processors, electronic mail, networks (SABINET, SAPONET), expert systems (using artifical intelligence), electronic fund transmission and banking systems, management information systems, circulation, acquisitions, serials control and other library function-dedicated software, integrated library systems (in which various functions share a common database), optical character recognition (for example barcoding), front end packages (which assist in searching databases) and mangement information systems.

Not only do we need to process our own information, but we also need to make parts of it, like the catalogue, available to users, and other selected section available to other librarians and administrators. These examples of IT should process and communicate information faster and more accurately. Several jobs may also have fewer boring aspects, as a result. All of these examples, and in particular the library-specific products, should increase the user-friendliness of the library system as a whole.

Computerized services or products may be hired or leased. The services provided by SABINET and EBSCO fall into this category.

Thirdly and finally there is that information which, for reasons of space, cost, security or law cannot be contained within the library of information centre but which needs to be accessed periodically by librarians or users.

Technologies supporting this category include teleconferencing, satellite/video conferencing, facsimile-telefax, data transmission networks (eg Diginet), externally created and maintained databases (numeric, full-text, bibliographic), telex, microform, reprographic equipment, electronic mail, videotex and teletext.

Here IT is used to access information which is stored remotely, usually in electronic form (or which may be converted into electronic form). Through these means, the library will be able to act as a gateway to this information. Additionally it may process incoming materials more rapidly, and provide more complete coverage.

It may be noted that there is a certain multi-functional aspect to several of the technologies mentioned above. Many of them, in assisting the librarian or information manager in the execution of his/her work, are simultaneously providing special, or more customized, or speedier services to the user group.

While it is beyond the scope of this Workshop to discuss the impact that information technology will have, or indeed is already having, it is useful to contemplate Kochen's observation (6, p. 148):

"A technology is a codified, communicable procedure for solving problems. Technologies develop in three stages. In the first, they enable us to do what we are now doing, but cheaper, faster, better. In the second stage, they enable us to do what we cannot do now. In the third, they change our lifestyles."

IT will have continuing effects on work, home and leisure patterns in all communities. It will continue to influence global society in broad ways - habits, customs, education, economics, entertainment - indeed, culture in its broadest sense. For libraries and information centres, the impacts will be felt in the areas of collection development policy-making, building design, departmentalization and organizational structure, career paths, job specifications and skills, personnel management, and professional procedures such as cataloguing, acquisitions and reference.

I would like to end by trying to achieve a balance between technophrenia and technophobia - the first a frenzied enthusiasm, and the second a great fear.

As far as technophobia is concerned, I hope that this Workshop will assist in overcoming this. It is comforting to know that as librarians and information managers, we are already familiar with many of the concepts involved; to a large extent it is a matter of becoming familiar with the equipment and techniques. In this sense, "Plus ça change, plus c'est la même chose". As far as too much enthusiasm is concerned, let us beware that we do not become more fascinated with our new tools than with our users. Our concern with technology should not detach us from the people we serve. We need also to be aware that technology does not provide all the solutions, and also that solutions to problems do not always involve technology.

We need to be particularly aware of the problems involved in the transfer of technology into our unique, South African environment. Bessant, amongst others, has given reasons why IT is not used in developing countries. (2, p. 178-9). These include:

- The international recession
- Shortage of suitably trained manpower
- Shortages of suitable technology, in specific areas
- Development and system costs especially software
- Lack of effective project management
- Lack of information and knowledge about the technology, especially of applications
- Lack of compatability of the technology with the organisation

While prediction is always a hazardous occupation, I will venture to suggest that all libraries will make use of IT to a greater or lesser extent, in a wide variety of configurations. This is because of the challenges posed by users, innovation, recession, conservation of resources, and increasing wages. Such use will have an impact on management and other procedures, and not least on job descriptions and our future careers.

A final word of warning before all the good news: this is from an article by Leonard Freiser in Saturday Review (5, p. 79):

"Technology unsupported by a philosophy and a program degenerates into gimmicks; technology ignored by the professionals in the direct line of fire develops a new corps of professionals who can replace the old."

I think we are all sensitive to these sentiments. I do however believe that we, as information professionals, have the knowledge and the philosophy. From the attendance here today, it is clear that we do not intend to ignore the technology.

References

1. Bearman, Toni Carbo (1985) "The information society in transition" ASIS Bulletin Aug/Sept.

2. Bessant, John (1984) "Information technology and the North-South divide". In: New Information Technology, edited by Alan Burns, Chichester : Ellis Horwood, pp 170-185.

3. Berry, John (1985) "Library use of microcomputers : massive and growing" In: Library Journal, Vol. 110 (2) pp48-50

4. Burns, Alan (Ed.) (1984) New Information Technology Chichester : Ellis Horwood.

5. Freiser, Leonard (1965) "Toronto's Education Centre Library" In: Saturday Review, Vol.68, pp79

6. Kochen, Manfred (1981) "Technology and communication in the future" In: Journal of the American Society for Information Science

7. Matthews, Joseph R. (1985) "Unrelenting change : the 1984 automated library systems market place" In: Library Journal, Vol. 110 (6) pp 31-41

8. Musiker, Reuben (1985) The new technology in South African libraries: an update to 1984. In: South African Journal of Library and Information Science Vol. 53(2) pp 68 - 72

9. Yaghmai, N Shahia and Jacqueline A Maxin "Expert systems : a tutorial" In Journal of the American Society for Information Science, Vol. 35 (5) pp 297-306.

SEARCHING REMOTE DATABASES*

S F ROSSOUW

Institute for Medical Literature
S A Medical Research Council

**Backgroundpaper prepared for an online demonstration presented at the UCT/SAILIS Workshop on Computer Applications in Information Systems, Cape Town, 26-27 November 1985*

SEARCHING REMOTE DATABASES

1 INTRODUCTION

Overseas databases were first accessed from South Africa almost ten years ago.[21] Today, most of the larger South African university libraries, all of the information services (MRC, CSIR, HSRC etc), and any number of special libraries routinely use remote databases, although I suspect that most of them are still hooked on DIALOG.[20]

The bulk of usage by these libraries is probably what one can refer to as conventional searching, ie retrieving references from bibliographic files such as ERIC, INSPEC, CHEMABS and MEDLINE.[2]

New databanks with facts rather than references, emerging end-user systems, full-text databases, electronic mail, videotext and gateway systems are now appearing and should be integrated into the library of today.

In this presentation some representative databases and vendors will be demonstrated, with a comprehensive list of vendors given in Appendix 1. This is followed by a discussion of the equipment required and procedures to be followed in accessing these databases and services. Lastly, the cost implications are referred to.

The frequent references to biomedical databases should be seen as examples only - similar databases and systems are available for most disciplines.

2 DATABASES AND SERVICES

2.1 Bibliographic Databases

Virtually all of the traditional library indexing and abstracting tools such as *Chemical Abstracts, Index Medicus, Books in Print* and the Wilson indexes, are nowadays searchable on computers located in the USA, Europe, Australia and Japan.[19] Online catalogues such as OCLC and specifically SABINET will be discussed in detail by other speakers.

The more popular databases are offered by several vendors. *Chemical Abstracts* for instance is searchable on at least half a dozen different systems. Some databases of course are available through only one vendor.

Although online searching of these databases offers numerous advantages over using the printed counterparts[18], the end result is still only a list of references to where the needed information may be found.

2.2 Full-text Databases

A major step towards overcoming the above drawback of bibliographic databases was taken with the offering of the full text of journals and monographs in computer-readable form. A leader in this area was of course Mead Data Central with its LEXIS/NEXIS/MEDIS legal and medical databases, and now also offering *The New York Times*.[1]

Bibliographic Retrieval Services (BRS) is also very active in this field with its BRS/COLLEAGUE service offering the full text of leading medical journals and core medical textbooks.[5] Other vendors are following the trend, e g DIALOG with Drug Information Full Text (DIFT), and Data/Star with Clinical Notes Online (CNOL) and Martindale's Pharmacopeia.

These full-text databases enable one to locate the actual information immediately rather than a reference and thus significantly enhance the quality and immediacy of one's services.[22]

2.3 End-user Systems

The proliferation of microcomputers and increased computer literacy is resulting in an increasing demand from individuals to do their own online searching rather than requesting searches through an intermediary.[7]

The vendors, having saturated the library market, are looking at these end-users of information as a potentially lucrative market ready for exploitation. This is indicated by the appearance of user-friendly software such as BRS/After Dark[14] and DIALOG's Knowledge Index[11] for home users, and BRS/COLLEAGUE[10] or NLM's Physician Data Query (PDQ) and CITE for the medical profession.[8]

Whether end-user searching will be boon or bane to the library remains to be seen. If past experience is anything to go by, we have always had patrons doing their own searching in printed indexes and catalogues, with others turning to the reference desk with their needs. The change in medium from printed index to electronic database should not therefore be seen by librarians as a threat - it could be a stimulus to their services.[23]

2.4 Electronic Mail

Most vendor computers make provision for the taking and passing on of messages, such as orders for manuals or photocopies of articles referenced in particular databases, e g DIALORDER on DIALOG.

With the increasing coverage by database producers of 'grey' literature, material normally not easily obtainable through booksellers, online ordering of publications will enable libraries to speed up their acquisitions process considerably[6].

Other vendors, such as ALANET, the American Library Association's electronic network, enable libraries to communicate with each other for purposes such as inter-library loans.[15] Even libraries not belonging to ALANET can be reached as the service is linked to the telex network to which virtually all libraries do have access.

2.5 Gateways

Many vendor computers are linked to computers of other systems on which a variety of other information sources and services can be utilised without re-dialing.

Examples of these are the Official Airlines Guide (OAG) on DIALOG or ALANET; the electronic newswire services of UPI, AP or Deutsche Presse-Agentur on ALANET, or the Standard Bank on BELTEL.

These links (or gateways) make it possible to place orders for photocopies with document suppliers such as University Microfilms International or to place classified advertisements in *American Libraries*. It is even possible to monitor the filing of stories with the news agencies the moment they are received at the agency.

2.6 Videotext

Viewdata systems such as PRESTEL are beginning to be used by overseas libraries to provide information on items such as the weather, sporting and cultural events, and as a referral service.

In South Africa BELTEL has now been available for a year or more on an operational basis, but few libraries seem to be interested in experimenting with its potential. The MRCs Institute for Medical Literature is registered as an Information Provider with BELTEL - come and see us in the exhibition area.

Available pages give information on the services provided by IML, including a request form for online searches or for photocopies of journal articles. These requests are retrieved via the BELTEL Mailbox facility.

It is clear therefore that there are a number of systems and services that those libraries already online can start implementing today at very little additional cost, but with great improvements in the quality and speed of their services.

3 TECHNICAL ASPECTS

To enable one to utilise remote databases and services, certain procedures have to be complied with, and the necessary hardware and, in some cases, software must be available.

3.1 Vendor Contracts

Most vendors require a fairly straightforward contract before issuing users with identity codes with which to access their systems. Very few require a subscription, but merely invoice one for actual usage.

The names and addresses of a selection of vendors are given in Appendix I, with an indication of the services and databases that they provide. Rates range from around R30 per hour for connect time and ± R0,25 royalty per citation on some databases to hundreds of rands per hour and equally high royalties on others.

3.2 Equipment

Virtually any communicating device can be used to access remote databases - dumb or intelligent terminals, microcomputers, or word processors. The very least, and also the cheapest would be a so-called acoustic coupled dumb terminal into which the telephone handset is plugged.

All non-acoustic terminals and micro's require the addition of a modem to make the connection to the telephone network. This 'black box' enables the digital signals of computer equipment to be transmitted in analogue form over telephone networks.[12]

Microcomputers and word processors additionally need a telecommunications program to enable them to link to the networks giving access to remote vendors. A printer is another essential addition.

3.3 Telecommunications

The connection between one's terminal and the remote databases is of course the Post Office's network, SAPONET, about which Mr De Silva will have more to say.

3.4 Training

Efficient and therefore cost-effective utilisation of remote databases can only be accomplished when one is familiar with the nature and functions of the sytems and the content and structure of the databases.[3]

Although self-training with the aid of vendor and database manuals[4] and practice on training files such as ONTAP on DIALOG or MEDLEARN on NLM, can be fairly effective, attendance at formal training courses should be seen as a priority.

Opportunities to attend courses in South Africa (presented by vendors or database producers) are severely limited - join the South African Online Users Group (Neville Spicer, National Chairman, c/o CSIR; Paul Meyer, Western Cape Branch, c/o UCT Libraries) to receive notification.

To keep current with changes to systems and databases, get your name on the mailing list for newsletters and announcements of search aids put out by vendors and producers.[16] A fairly comprehensive and up-to-date listing of search aids is available from the IML exhibition booth.[13]

4 FINANCIAL IMPLICATIONS

Although online information retrieval may be cost-effective, it is certainly not cheap.[9] Any library considering going online, must take the following factors into consideration:

4.1 Computer Usage

Computer connect time has traditionally been charged at a flat rate per hour. One therefore gets better value for money by working at a higher speed (120-240 characters per second) rather than the once popular 30 characters per second.

This situation is subject to change however, and already NLM has introduced a so-called charging algorithm where amongst other things the number of characters transmitted is taken into consideration. This procedure makes online printing less attractive compared to the cheaper offline printouts on paper.

Connect hour charges typically vary between R60 and R150 per hour, with a very few somewhat cheaper, and any number much more expensive.

4.2 Database Royalties

Librarians are accustomed to paying a fixed annual fee per subscription to printed indexes or abstracting journals. The amount of usage has no bearing at all on the fee. Every time a reference is retrieved from an online version of the same index however, a royalty becomes payable to the database producer. No wonder the database producers perceive downloading to be a threat!

These so-called hit cnarges vary between R0,25 and R1 per citation, with as much as R50 or more for certain kinds of records such as patents and specifications. One hundred references printed from BIOSIS, the *Biological Abstracts* database, will cost almost that much in Rand at 28 US cents per citation.

4.3 Equipment

A minimum outlay would be around R2 000 for an acoustically coupled dumb terminal. If a modem has to be acquired, work on another R700-1 000 for a rather slow one. A fast modem is considerably more expensive.

A memory terminal, i e one that enables one to load procedures for making the connection and a starting search profile beforehand, can be obtained for R5 000+.

For about the same sort of investment one can of course acquire a microcomputer that can be used for other purposes as well. The addition of printers (R300-R2 000), screens (monochrome or colour (R200-R1 000), and telecommunication programs (R150-R400) should however not be forgotten.[24]

4.4 Telecommunications

Although one can dial most vendors directly via the ordinary telephone network, the use of the Post Office's packet switched network, SAPONET, is normally significantly cheaper and less subject to line interference.

A minimum requirement is an access code (Network User Identifier) at R25 per month, with usage billed at rates varying between R40-R60 per hour for conventional online searching. A leased line to the nearest SAPONET node could be considered for high volume data traffic.

One should be aware that if you do a lot of online printing the rates go up to about R200 per hour as SAPONET is a packet switched network where charges are based on the number of characters being transmitted.

4.5 Training

Self-training referred to above is available by using online training files such as DIALOG's ONTAP at $15 per hour of connect time plus telecommunications charges - work on about R100 per hour total. It takes 2-3 hours to complete the MEDLEARN program on NLM at similar rates.

The Institute for Medical Literature offers a 4 day intensive MEDLINE course with hands-on opportunity at R75 excluding subsistence and travel expenses of trainees. The forthcoming DIALOG course is offered at R170 for a full-day's training course for beginners.

5 SUMMARY

Online searching of remote databases offers many advantages. New services are becoming available and should be utilised to ensure that libraries stay abreast of new techniques and technologies. Whether a particular library would find it cost-effective to perform these functions itself depends on the comparative costs of buying-in these services through a third party such as the CSIR or MRC.[17]

Note: Text set electronically from input prepared on Wang Alliance word processing system.

REFERENCES

1 Bergheim, K. Taking the toil out of the law. *Infoworld*, 6(23), 35-5 (1984)

2 Beyerly, G. Online searching: just another tool for document librarians. *Gov Pub Rev*, 11(3), 203-10 (1984)

3 Borgman, Christine L, D Moghdam *and* PK Corbett. Effective online searching. New York, Dekker, 1984, pp. 175-191: Sources of training.

4 Chen, C *and* S Schweizer. Online bibliographic searching: a learning manual. New York, Neal-Schuman, 1981.

5 Clancy, S. BRS-Saunders COLLEAGUE: information service for medical professionals. *Database*, 8(2), 108-21 (1985)

6 Colbert, AW. Document delivery. *Online*, 8(5), 112-13 (1984); 8(6), 103 (1984); 9(1), 104-5 (1985); 9(2), 116-17 (1985)

7 Dagani, R. Online literature searching catches on among researchers. *Chem Eng News*, 62, 29-31 (1984)

8 Doszkocs, TE. CITE NLM: natural language searching in an online catalog. *Info Technol Libr*, 2(4), 364-80 (1983)

9 Fenichel, Carol H *and* TH Hogan. Online searching: a primer. Marlton: Learned Information, 1981, pp. 77-83: Costs and charging policies

10 Florio, JP. COLLEAGUE: an evolving medical information network. *Intern J Microgr Video Technol*, 4(1), 13-16 (1985)

11 Glossbrenner, A. Looking it up on Knowledge Index. PC *Mag*, 3(14), 369-72 (1984)

12 Howitt, D *and* MI Weinberger. Databasics: your guide to online business information. New York, Garland, 1984, pp. 26-30: Making the connection

13 Jacobs, Annemarie *and* S Rossouw. MIDS search aids. Parow, MRC/IML, 1985

14 Kesselman, M. Online update: After Dark. *Wilson Libr Bull*, 58, 652 (1984)

15 Kittle, PW. Putting the medical library online: electronic bulletin boards and beyond. *Online*, 9(3), 25-30 (1985)

16 Lambert, Maureen *and* Fern Brody. Tailoring search strategy for a highly specialized topic...proof once again of the necessity of using file documentation to the fullest. *Database*, 8(1), 58-61 (1985)

17 Maranjian, L *and* RW Boss. Fee-based information services: a study of a growing industry. New York, Bowker, 1980.

18 Naber, G. Online versus manual literature retrieval. *Database*, 8(1), 20-24 (1985)

19 Palmer, RC. Online reference and information retrieval. Littleton, Libraries Unlimited, 1983.

20 Rossouw, SF. Choosing an online vendor. *S Afr J Libr Inf Sci*, 52(2), 62-69 (1983)

21 Rossouw, SF. Hello from Elhill 3. *S Afr Libr*, 44, 109-112 (1976)

22 Tenopir, Carol. Full text database retrieval performance. *Online Rev*, 9(2), 149-164 (1985)

23 Williams, PC. How do we help the end user. *Nat Online Mtg*, 6th, Proc. 495-505 (1985)

24 Woods, LA *and* NF Pope. The librarian's guide to microcomputer technology and applications. White Plains, Knowledge Industry Publications, 1983.

ALPHABETICAL LIST OF VENDORS

ALANET

Full name:

AMERICAN LIBRARY ASSOCIATION'S ELECTRONIC INFORMATION SERVICE

Address:

ALANET System Manager, ALA Headquarters Library, 50 E. Huron St., Chicago, IL 60611, U.S.A.

NUA:

C031032121061141

SCOPE:

Electronic communication - mail, bulletin board. ILL and other forms, interface with telex network: gateway facilitiess to external information services; electronic newsletters.

BLAISE

Full name:

BRITISH LIBRARY AUTOMATED INFORMATION SERVICE

Address:

British Library; Automated Services Department, 2 Sheraton Street, London WIV 4BH, ENGLAND.

NUA:

C0234219200222; C0234227900102

SCOPE:

Bibliographic databases (concentrates on British Library products); cataloguing services; document delivery.

BRS

Full name:

BIBLIOGRAPHIC RETRIEVAL SERVICES, INC.

Address:

Bibliographic Retrieval Services, Inc; 1200 Route 7 Latham, New York 12110, USA.

NUA:

C0311031500020; C031103150002002; C0312551800007

SCOPE:

Bibliographic and full text databases (strong in education, biomedicine and business); end-user services; electronic mail; gateway.

D-S SYSTEM

Full name:

DATA-STAR SEARCH SYSTEM

Address:

Data-Star; Radio-Suisse SA, Schwartztorstrasse 61, CH-3000; Berne 1, SWITZERLAND.

NUA:

C0228464110115

SCOPE:

Bibliographic and full text databases (accent on biomedicine and business).

DIALOG

Full name:

DIALOG INFORMATION SERVICES, INC.

Address:

Dialog Information Services, Inc., 3460 Hillview Avenue, Palo Alto, CA 94304, U.S.A.

NUA:

C03106900803; C012541500007; C031104150004802

SCOPE:

Mostly bibliographical databases, covering all disciplines; some full text databases; directories; time series; gateway; document delivery.

D I M D I

Full name:

DEUTCHES INSTITUT FüR MEDIZINISCHE DOKUMENTATION UND INFORMATION

Address:

DIMDI; Weisshausstrasse 27; Postfach 42 05 80; D-5000 KöLN 41, GERMAN FEDERAL REPUBLIC.

NUA:

C026245221040006

SCOPE:

Bibliographic databases; concentrates on biomedicine

ICIS

Full name:

CHEMICAL INFORMATION SYSTEM

Address:

Information Consultants, Inc., 1133 15th Street, N.W. - Suite 300, Washington, D.C. 20005, U.S.A.

NUA:

C0311020200109

SCOPE:

An integrated online system covering a variety of subjects related to chemistry: database components provide actual data such as chemical and physical properties or toxicity values, while data analysis components allow manipulation of data such as statistical analysis, graphics and modeling.

INFOLINE

Full name:

PERGAMON INFOLINE LTD

Address:

Pergamon Infoline Limited; 12 Vandy Street, London EC2A 2DE, ENGLAND.

NUA:

C0234219200190; C0234219201281

SCOPE:

Mostly bibliographical databases - emphasis on technology and patents

NLM

Full name:

U.S. NATIONAL LIBRARY OF MEDICINE

Address:

National Library of Medicine; 8600 Rockville Pike; Bethesda, Maryland 20014, U.S.A.

NUA:

C0310600128800; C031103010002000; C0312530100022

SCOPE:

Mostly bibliographical databases, concentrating on biomedicine; end user systems; some databanks on a separate component known as TOXNET

QUESTEL

Full name:

TELESYSTEMES QUESTEL

Address:

Télésystèmes Questel; 83-85, Boulevard Vincent Auriol; 75013 Paris, FRANCE.

NUA:

C0208006040010; C0208006040011

SCOPE:

Mostly bibliographical databases, with emphasis on those produced in France; substructure searching on chemical files on a separate component

SDC

Full name:

SYSTEM DEVELOPMENT CORPORATION

Address:

System Development Corporation; 2500 Colorado Avenue; Santa Monica CA 90406, U S A

NUA:

C031061509; C031061475

SCOPE:

Mostly bibliographical databases, covering all disciplines; document delivery

WILSONLINE

Full name:

H W WILSON INDEXES ONLINE

Address:

H.W. Wilson Company, 950 University Avenue, Bronx, New York 10452, U.S.A.

NUA:

C0311021200040; C03106:H W WILSON

SCOPE:

All of the well-known Wilson indexes, as well as some directories.

SABINET - description and development; a brief overview

By Ilse van Niekerk

SABINET Manager: Research and Development

(Paper presented at a symposium: Computer Applications in Information Systems, Cape Town, 26 - 27 November 1985.)

Introduction

The South African Bibliographic and Information Network (SABINET) provides a nationwide, shared-access computerized bibliographic database system.

The goal statement of the SABINET explains its purpose and to a certain extent, its functionality and manner of operation.

> "To provide support for the cooperative creation, collection and distribution of non-commercial data for disseminators by means of a shared centralised and distributed computer-based infrastructure."

SABINET is based on the principles of cooperation and rationalisation. Founded from within the library and information community, SABINET operates with first hand experience of the needs and objectives of this community.

Voluntary cooperation was the keyword at the CSIR Conference Centre on 28 February 1983 when 40 organizations made a 10-year financial commitment to establish the South African Bibliographic and Information Network. A reciprocal commitment in the form of a subsidy decreasing over 10 years is received from the South African Government and granted through the Department of National Education. The independent SABINET, as a non-profit utility company, must become self-supporting during this time on income derived from services offered to the library and information community of Southern Africa.

But why was it necessary to establish such an organization? To find the answer to this question, a brief look is taken at the problems experienced by South African library and information services, and then at the various problemsolving options and tools that have been available to these institutions.

Problems experienced on the local level usually include the following:

- rapid increase in information items
- user demands for complete and rapid supply

- inability to be self-sufficient
- lack of funds, staff and space
- duplication of items, intellectual input, labour and expenditure
- costs of staff, materials and processing
- backlogs
- slow access to newly catalogued items.

Historically, libraries have looked towards cooperation to solve problems relating to the inability to be self-sufficient.

However, barriers to cooperation and resource sharing seemed to become more insurmountable as the problems on the local level became more difficult to handle. These barriers on the national level include:

- out-of-date published bibliographic tools
- incomplete union catalogues
- lack of resource sharing
- inadequate support of research
- inactive research materials
- lack of balanced bookstock
- inaccessible subject indexes
- non-standardised cataloguing and indexing
- slow communications.

More recently the move towards computerization of library processes and record keeping on the local level could solve certain local problems by making library operations smoother. Through computerization, the internal operations of certain national projects like the union catalogues were also made more efficient. But these computerization efforts, because they were mostly effected in isolation, in turn increased the barriers to cooperation as non-standard records and systems meant that information could not be freely exchanged. In many cases communication became more difficult than when the manual systems were in operation.

In South Africa various projects, cooperative and/or computerized (but not all online) produce products and services which could be of some help to libraries and information centres. These services and projects tended to address single areas of the problem as can be seen from the following lists:

- Supporting reference/information requirements on mainly non-monographic material:-
  - SASDI (SA Selective and Dissemination of Information)
  - SARIS (SA Retrospective Information Service)
  - TIS (Technical Information Service)
  - WATERLIT (Literature on Water)
  - Patent Information
  - MEDLARS & MEDLINE
  - News Clippings Index
  - Local In-house Subject Databases.
- Supporting additional library functions, mainly providing location information for monographs and serials:-
  - Joint Catalogue of Monographs (JC)
  - Periodicals in Southern African Libraries (PISAL).
- To provide support on all aspects, a multi-function computerized network was thus established as the
  - South African Bibliographic and Information Network.

To combat the problems on both the local and national levels it seemed logical to support cooperative efforts with computerization. Computerized networking efforts in other countries, but mostly in the US, Canada and the UK, had proven successful to various degrees. Although the overseas networks were mostly cooperative cataloguing systems with relatively slow developments towards the offering of other functions, SABINET was

planned as a multi-function facility from its inception. The functions to be offered had the aim to support the requirements for:

- local and national bibliographic control
- resource sharing
- provision of information
- technical processing in libraries
- national information flow
- service capabilities of participating institutions.

To this end the SABINET system supports a wide range of library and information functions. These include quick, efficient and cost-effective methods to automate reference work, bibliographic verification and cataloguing.

BRIEF OVERVIEW OF THE PRESENT SYSTEM

The SABINET system is based on the Washington Library Network (WLN) program package and is presently being implemented in three interrelated and interlinked subsystems, i.e. the Bibliographic, Acquisitions and Batch Retrospective Conversion Subsystems. A new system to accommodate the SAMARC format, multi-databases, interlibrary loans and SDI etc will replace the present system late in 1987.

On the network level, SABINET will support the functions of cooperative cataloguing, cooperative acquisitions, information retrieval and inter-library loans, thus improving national bibliographic control, resource sharing and information exchange.

On the local library level, the use of the integrated subsystems can assist in streamlining workflow, and in providing more effective local bibliographic control. Libraries with no in-house computerization can effectively computerize most of their Library functions through a terminal link to SABINET. On the other hand, institutions in various stages of computerization may support, enhance and extend their services through the functions available on SABINET.

SABINET will not provide purely local functions, such as circulation control and serials check-in, but records could be obtained from SABINET for use in such local systems.

Integrated Library Database

The SABINET Bibliographic Subsystem supports library service functions by providing access to an integrated bibliographic database. Subject, authority, bibliographic, orders and holdings information can be retrieved from the database and displayed using online searching capabilities.

The database includes computerized bibliographic records from the following sources:

- USMARC from Library of Congress 1969 +
- UKMARC from British Library 1975 +
- original cataloguing from WLN participants 1972 - Jul 1984
- online original cataloguing from SABINET participants 1985 +
- SANB from State Library - addition will commence during 1986
- the new system (end 1987 +) will accommodate many diverse abstracting and indexing databases.

Inquiry Function

The Inquiry Function is the basic online retrieval function which provides access to the database and thus supports all other functions.

Through a combination of access points and sophisticated search techniques the system provides for easy, powerful and very flexible searching of the files in the database. The result of an inquiry search is a display on the terminal screen, for which products may be requested, if so desired.

Features include the following:

- retrieval of bibliographic records for subject reference, location, cataloguing or oder purposes, or for ordering of products.
- retrieval of authority records to establish the authorised form of a heading, to narrow a title search, or to do a subject search.
- retrieval of order and order accounting information to establish the status of transactions.

- retrieval of bibliographic records through all normal catalogue entries as well as many additional access points.

External Tape Load Function

This function provides for building of the database through loading of bibliographic records, received on magnetic tape, from national bibliographic or other agencies or members of SABINET.

Matching programs isolate doubtful matches for human decisions on addition, replacement or rejection of records.

Online Cataloguing Function

Members of SABINET undertake to contribute their holdings information to SABINET and this is done by contributing cataloguing on exchange tapes or by using the online cataloguing facility. It relies heavily on the Inquiry Function to prevent duplication of data and effort, and to support standardization of data.

Features include the following:

- original cataloguing when the item is not on the database
- cooperative use of existing catalogue records, by adding information on location of items in the form of structured holdings statements.
- accommodation of limited private data fields for individual libraries.

Online Holdings Maintenance

Information on the location of items may be added to the database through online maintenance functions to help build up-to-date union catalogues, as well as building institution databases. While this information is valuable common information, it also forms the base from which catalogue products are produced.

Cataloguing Standards

SABINET supports the following as standards for original cataloguing: the current Anglo-American Cataloguing Rules (AACR2) and national bibliographic centre sources for name, series and subject authorities. The present system is based on the USMARC format, but a screen interface format, SABIMARC, is used. From 1987, the full SAMARC format will be the standard format for data input and communication.

Quality control is maintained for local input through a series of machine edits and human reviews (both at local and Network levels).

Acquisitions System

The Acquisitions System, planned for implementation will provide the capabilities required to create and maintain records of orders placed for library materials, from the time of selection through receipt and payment for regular and standing orders. Fund accounting will be available on-line.

Features will include:

- on-line placing of orders for hardcopy or on-line transfer to vendors
- monitoring and maintenance of all items from selection through receipt and payment
- on-line access to the Acquisitions Files through order numbers or other access points via the Bibliographic file
- monitoring of subscription renewal and payment
- maintenance of fund and accounting records
- automatic generation of standard forms and reports, e.g. purchase orders, claim letters, vendor reports, accounting reports, etc.

Batch Retrospective Conversion (RECON)

The Batch Retrospective Conversion or RECON Subsystem, through online or tape input, provides SABINET participants with a low cost method for adding to the online Holdings File shelf numbers and other location information for items represented by bibliographic records on the database. This process is not used for current acquisitions. Holdings information for newly acquired materials is input directly to the Holdings File.

The addition of holdings information via the RECON process requires the provision of minimal identifying information and the library's location information for an item. Processing runs are scheduled at regular intervals. During batch processing, the RECON records are machine edited and a "search key" is created from the data to match against bibliographic records in the database. When there is an exact match between a RECON record and a database record, the Participant's holdings statement is automatically added to the Holdings File.

Printed reports on successful matches for which holdings statements are automatically added to the database, as well as other problem conditions are provided for subsequent action.

Products from SABINET

Numerous regular and ad hoc reports can be obtained to report on the activity undertaken using the various subsystems. Of these the most visible and most used are bibliographies, purchase orders and accounting reports from the acquisition system, and the catalogue products which are available as catalogue cards and book labels, catalogue records on computer tape, and microfiche catalogues with optional indexes for names, titles and subject headings.

Electronic Mail

Although SABIMAIL is an electronic mail function which is designed to interact with the planned new SAMARC system, it can also function independently of the database and is therefore brought forward for implementation in the second quarter of 1986.

SABIMAIL will enable SABINET users, and also institutions with Telex connections, but which are not members of SABINET, to communicate through the telecommunication network and their terminals.

The following components will be catered for:

- bulletin boards
- document creation and maintenance
- message functions
- document storage facilities (active and archival)
- free format mail
- formatted mail eg. interlibrary loan forms

- inbox facility (browse, alternative destinations)
- outbox facility (browse, display, cancel, repeat)
- action on incoming and outgoing mail (display, postpone, forward, file, acknowledge, reply, cancel, repeat)
- supervisory functions

SAMARC-BASED LIBRARY/INFORMATION SYSTEM FOR SABINET

The SAMARC-based system that is presently being developed for SABINET is planned for implementation late in 1987. This development will supply a totally integrated full function library and information system based on the South African national exchange format for machine-readable bibliographic records. The system will thus provide for very special local requirements in the handling of all types of information materials ina multi-lingual community.

Because the same user group is being addressed by the new system, it will offer all the functions present and required in the present system. A number of additional functions will be offered, while the existing functions will be greatly improved to smooth the workflow. A graded user interface with a comprehensive online HELP function will enable the uninitiated as well as the experienced user to work in the easiest way and optionally the shortest route. It will be possible to interact with the system in either Afrikaans or English.

Modern computer languages and methodologies are being used in the development work to ensure ease of maintenance and marketability of the new system. These strategies will also create a new foundation for later additional developments.

The basic requirement for the system is for a library support system which operates in parallel with a sophisticated information retrieval and dissemmination system. In addition to this an electronic mail system will be able to function either on a totally separate basis, or as an interface system to the databank.

The basic philosophy of SABINET remains, i.e. to supply an infrastructure, together with training and support. Database creators and suppliers will have total responsibility for the content of their databases. The system will offer integrated functions for building databases, extracting information from them, and also for the production of various hardcopy and computer media products from the various databases. Downloading is a requirement.

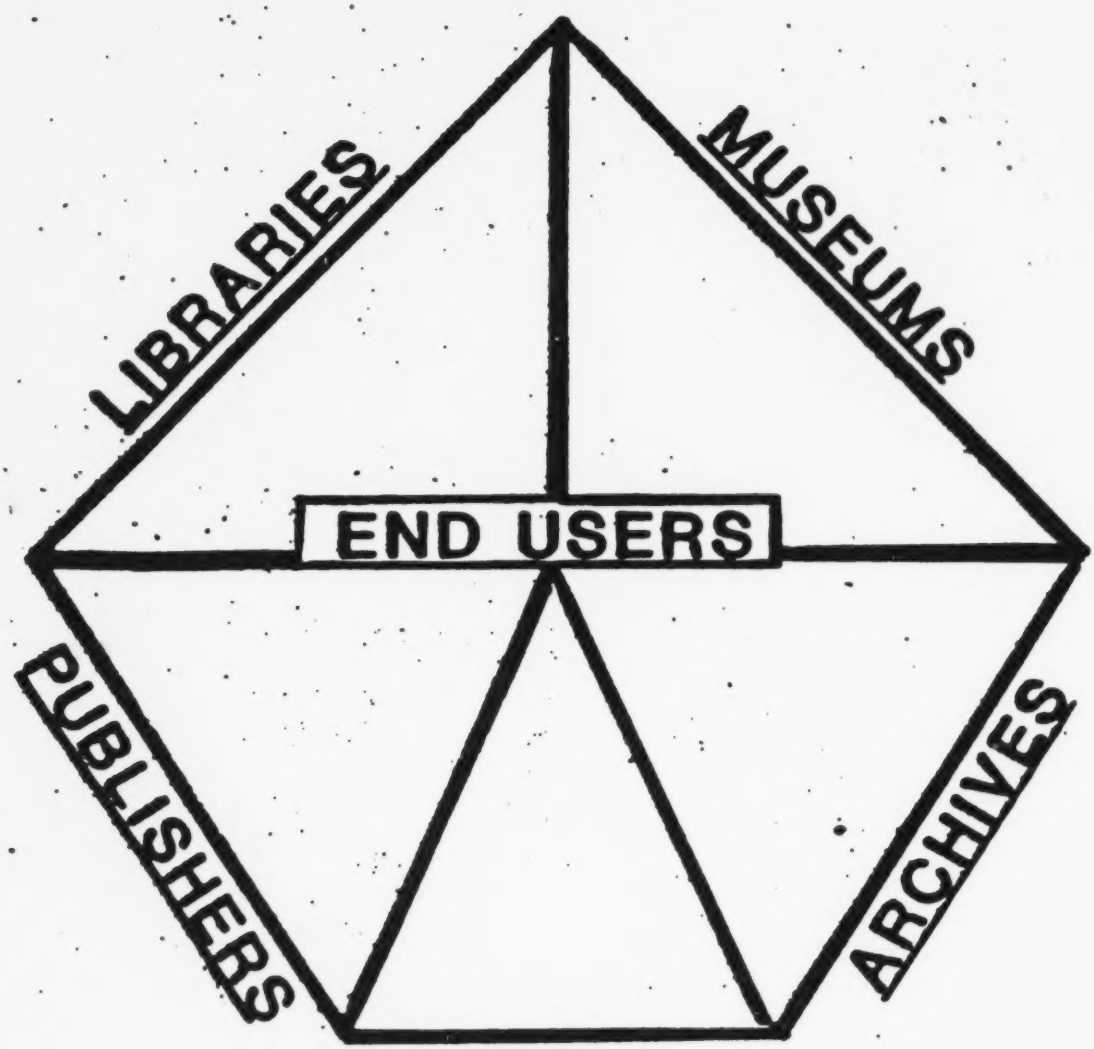
The databank will accommodate a variety of databases which may be grouped into different sectors and within these sectors into smaller related interest pools. The library database will function on the full SAMARC capabilities, but other databases will only need to fit broadly into the SAMARC framework for identification of data elements for retrieval and manipulation.

Each database could have a complete set of files, including seaparate authority or thesausrus files, and could therefore follow their own data standards. Guidelines for database producers would be available to ensure the optimum use of the capabilities of the system.

Information Retrieval Facility

The online search function will be flexible, sophisticated and efficient, and could be compared to those of systems like DIALOG, BRS, etc. Many more access point elements will be provided in addition to those already already available in the present system. Present search techniques will be greatly augemented, and searching across databases will be an option. A Selective Dissemination of Information (SDI) facility is also planned.

SABINET DATABANK
FOR
INFORMATION PROCESSORS



Other New Functions and Aspects

Although the most extensive development is in the information storage and retrieval component, there are a number of other new functions planned. The electronic mail facility (SABMAIL) will be implemented before the rest of the new system and has already been discussed. The SDI service has been mentioned, as well as a variety of product possibilities and online transfer of information. An Interlibrary Loan Control System will be provided to function along similar lines to the Acqusition System.

In the design of the new system, the requirements and problem situations of the library/information community were re-examined to ensure that the services present viable and attractive options. The co-existence with in-house is seen as an important aspect of the functioning of the network as a service organization.

SABINET MEMBERSHIP

Membership of SA INET is voluntary and open to all organizations who may benefit from the system. All the initial members were full founder members and these included industrial, research, public corporation, commercial, provincial, municipal, national, university, government and technikon libraries. At the close of 1985 there 50 full members.

The obligations of full members include a commitment until 1993 This commitment includes an annual membership fee, a cooperative financial responsibility for the company, and an undertaking to contribute their cataloguing and holdings information to the SABINET database. Full members benefit from this commitment in that the network carries most of the telecommunication costs, they have a freedom of choice as far as the selection of services and modes of use goes, full members have full voting rights, and they enjoy free training and consultation rights. At present all full members are connected with the system through dedicated lines into a telecommunications network with the SNA/SDLC facility (synchronous).

The Board of SABINET has approved the introduction of a new type of user, called the Associate Member. This decision was taken to be able to offer SABINET services to a broader spectrum of Southern African libraries. As a result of the additional membership the content of the SABINET database would also be enhanced with additional information on the holdings of information items in the country.

The main differences between Full and Associate Members are the following: long-term (10yr) and short-term (1yr) contracts, higher service and product tariffs for Associate Members to balance the financial commitment of the Full Members, communications costs are for the own account of Associate Members, they will pay for training and manuals, and because many of these may be one-person libraries without trained personnel, will only be permitted to catalogue directly on SABINET with the approval of the Member Committee.

BEST COPY AVAILABLE

DIAL-UP ACCESS TO SA INET

Planned for April, 1986, SABINET can be accessed via the SAPONET-P packet switching network using an IBM Personal Computer or equivalent, with a low-cost standard asynchronous software package available from SA INET. This method and the equipment required is essentially equivalent to that used in South Africa to access overseas and other remote databases, e.g. DIALOG.

The options exist to either dial into the SAPONET Triple X service which is available in most large centres, or obtain a dedicated line to the IBM PC. The second option does require the purchase of a so-called "PAD" at the user site.

T is method of access is not a substitute for the existing IBM or IBM-compatible synchronous terminals which Full Members are using. It rather provides for a low speed alternative where small volumes of work are performed. Members planning to use more than approximately 50% of a service unit (20 000 enquiries) per annum, or wanting to catalogue online, will probably require the use of the faster IBM-style synchronous terminals.

BENEFITS

Apart form the general benefits that automation offers, Sabinet users, may enjoy the full benefits of cooperative cataloguing, cooperative acquisitions, up-to-date union catalogues, resource sharing in its fullest sense, access to vastly increased information sources outside his own organization, and many other benefits which may differ from instituttion to institution as the local conditions and requirements differ.

INTRODUCTION TO INTEGRATED LIBRARY SYSTEMS : LECTURE NOTES

Ms N M Lodder

NATIONAL INSTITUTE FOR INFORMATICS, CSIR

Notes used for lecture presented at the
Workshop on Computer Applications in
Information Systems, Cape Town
26 - 27 November 1985

INTRODUCTION

An important trend in the last few years has been the development and use of integrated library systems. Nowadays when a library is looking for a system for its use, it will often settle for nothing less than an integrated system even though it may not immediately need all of the facilities available in such a system. So the trend is nowadays to use a library system in which provision is made for all of the library's functions needing computerization and in which the data used or created by these functions is shared.

This trend has followed from advances made in computer technology and increasingly powerful facilities. The mini- and mainframe range of computers is of particular relevance here as fully integrated systems are still somewhat beyond the capabilities of the microcomputer range. These developments have taken place together with the development of online interactive systems - and so integrated library systems are invariably also online interactive systems.

In this short lecture the importance of integrated systems in the context of a library system is described as well as the advantages of such systems when compared to stand-alone systems in which data and procedures are not shared.

INTEGRATED SYSTEMS IN THE LIBRARY CONTEXT

The importance of integrated systems in the context of a library system becomes clear from a study of the functions and activities of a library.

A library's functions and activities revolve around documents of various types - books, journals, audiovisual material, etc. and in some cases around documents-within-documents such as journal articles, conference papers, reprints, etc. The major functions of a library can be described in general terms as:

* selection of documents to be obtained by the library
* acquisition of the selected documents

* processing (cataloguing, classification, indexing) of documents acquired
* storage and presentation of documents
* making documents available for use through circulation, photocopying, etc.
* management of the library and its activities.

Each of these functions is concerned with documents, e.g. selecting the books and journals to be purchased or articles to be obtained, acquiring the documents, cataloguing them, issuing and circulating them and maintaining management information about them such as the frequences with which they are used or the subject fields which they cover.

It follows from this, therefore, that in the computer records associated with these functions, data have to be included which identify the documents associated with a particular activity. So, when ordering a book in the acquisitions function for example, bibliographic details of the book (author, title, edition, publisher, etc.) have to be recorded; when issuing a book data indicating which book has been issued must be recorded; and so on. The document records therefore form the core records in a computerized library system, i.e. the catalogue or bibliographic records or bibliographic data base form the core of the system.

Following from this it is therefore logical to use a single bibliographic file or data base to which all functions have access in order to add, delete or alter records or to copy records.

An integrated library system can therefore be described as a system which provides far more than one library function and in which data are shared by all library functions.

ADVANTAGES OF INTEGRATED LIBRARY SYSTEMS

An important advantage of an integrated system is that unnecessary duplication of data can be avoided. For example, a bibliographic record created when a book is ordered can be used in the cataloguing function where it may just need to be upgraded, and the same catalogue record can be used when the book is issued. This is a very important advantage because so much of the record-keeping involved in a library system concerns the bibliographic records. A further point is that the bibliographic records needed are often long, complex records and so considerable storage space is saved by using a shared data base and in addition duplication of programming and maintenance work involved in processing the bibliographic records is avoided.

A second advantage is that data accuracy and currency can be more readily achieved when only one record for a document and one data base is involved. One doesn't have the problem, for example, of having to add a bibliographic record for a new document to several files or of having to delete several bibliographic records from different files when a book is withdrawn from the collection. Nor does one have the problem of keeping several files up to date; in an integrated system for example as soon as a book has been received in the acquisitions department a bibliographic record exists in the data base which is available for use by any other functions, e.g. for issuing of the book.

A third advantage is that the same computerized procedures and online dialogue can be used in the various library functions, avoiding duplication of programming work and presenting a less confusing image to the system user. The librarian does not for example have to learn a different system dialogue for searching the bibliographic/catalogue file when carrying out acquisitions tasks and when carrying out cataloguing tasks. At the same time the same computer programme routines can be used whether one is searching the bibliographic file using the acquisitions module's functions on the cataloguing module's functions.

DISADVANTAGES/PROBLEM AREAS

Although there are distinct advantages in integrated systems there are also some disadvantages which should not be overlooked.

An integrated library system is a very complicated system and hence more likely to be subject to errors and to require considerable expertise to maintain and enhance. The combination of the complex type of data found in the bibliographic data base and the several functions which the library system must cater for, many of them involving complex tasks, results in anything but a trivial computerized system.

Following from this one can assume that such systems are expensive to produce and maintain, and expensive to run.

An integrated library system may be more sophisticated than needed in that it provides for more functions than are required in a particular library or for greater sophistication/complexity in some functions than is needed. So a library may end up with a system providing for more features than are really wanted, possibly adding to the purchase and maintenance cost of the system.

There are also instances where complete integration of all library functions into a single system is not appropriate. For example, it may be found that in some libraries the type of activity associated with the library's documents (books, journals, etc.) and documents-within-documents (journal articles, etc.) is so different that their combination into a single system would make the system unnecessarily cumbersome and complex. It may be found for example that sophisticated keyword indexing and retrieval facilities and no circulation facilities are required for the collection of documents-within-documents whereas more complex cataloguing and classification as well as circulation facilities are required for the book collections.

CONCLUSION

Integrated library systems, although they have their disadvantages, represent an important advance towards systems which are appropriate to the complex requirements of libraries.

Although much progress has been made towards the development of integrated library systems, however, the reality is that there are as yet no systems available which can cater adequately for all of a library's major requirement. The systems are still evolving. Sometimes their starting point has been single-function systems, such as a circulation system, on to which other functions have been added. The

extent of the facilities provided in the functions of a system may therefore differ from system to system. For example, a system which developed from a stand-alone circulation system may provide excellent circulation facilities but only rudimentary cataloguing facilities, or a system concerned primarily with book acquisitions may provide inadequate acquisition and accounting procedures for periodicals.

It is important therefore that a library, when considering using an integrated system first determines what functions it needs and at what level of sophistication these functions must be performed. It must then evaluate available systems accordingly, remembering that

1. there is great variation in what the available systems can actually provide - and has been proven in practice!

2. that the level of sophistication and reliability of the functions provided for within a system may differ.

SUGGESTED READING

1. De Gennaro, Richard. Integrated online library systems : Perspectives, perceptions, & practicalities, Library Journal, 1 February 1985, pp. 37-41.

2. Grosch, Audrey N. Computer application : Integrated vs individual. In: The Professional Librarian's Reader in Library Automation and Technology. Knowledge Industry Publications Inc. : White Plains, New York, 1980, pp. 89-93.

November 1985

URICA OVERVIEW

Application Software

Kerry Stephenson

1. Introduction

The URICA Library Information System is a set of five integrated modules which cover all the major functions required by libraries:

* Information Retrieval
* Acquisitions
* Serials Control
* Circulation
* Cataloguing

The modules of URICA are closely integrated but can be implemented separately. Included in the software are conversion facilities to help the library generate the URICA database.

URICA only runs on the Microdata M6000 and M9000 series of mini computers. Thus URICA has been designed to take full advantage of their unique system software.

2. The Bibliographic Database

The Bibliographic Database is the heart of URICA and contains all the bibliographic information for each work in the library's collection. It contains one main file with a number of discrete authority files and index files, which link together to form a highly efficient relational database.

The authority file entries and their linking indexes are maintained by URICA utilising relationships designed to suit a library's requirements for fast, efficient storage and retrieval of bibliographic records.

Features of the Microdata hardware combine with the URICA software, to produce an unusally high degree of efficiency in the area of optimum use of disk storage space. These include:

* Variable data content - only required information is stored
* Variable length data - no padding with zeros/spaces to fill data fields
* Lack of redundancy - common data base for all URICA modules

URICA offers complete flexibility of data. Every element of data in the Bibliographic Database is optional; no data is mandatory and additional elements may be specified. There is no minimum field, record or file size - nor is there any practical maximum.

Data held within URICA is not maintained in a MARC format but in a form more suitable for fast retrieval and efficient storage. The great benefit to the Library is that it makes URICA completely independent of any particular MARC format

or, in fact, any format at all. Routines are available to translate from various MARC formats (UKMARC, AUSMARC, LC, UNIMARC, etc). In addition, routines are available to accommodate non-MARC formats.

3. Information Retrieval

The Information Retrieval module is the key to the successful exploration of the URICA database and provides access to information at a multiplicity of levels, and is available from all modules.

The comprehensive on-line enquiry facilities retrieve information from the URICA Bibliographic Data Base by using a variety of access points. These include:

* Title, title added entries and keywords
* Personal author, surname and elements of surname
* Corporate author, subordinate bodies and keywords
* Subject headings and keywords
* Series title and keywords
* Bibliographic record number
* ISBN/ISSN
* Vendor number
* Borrower
* Accession number

Not all these access points may be needed by a library; others can be added to suit a particular library's requirements.

Output from URICA consists of standard displays which provide sufficent details to identify the work and its present location; without giving so much information as to be confusing. When more detail is required, as in the compilation of a bibliography, greater content can be selected via function related displays.

It is not always necessary to enter a complete bibliographic term when trying a retrieval. URICA permits the size of search keys to be reduced via:

* Keyword indexes on the authority files
* Truncation of either end

General access can be allowed; however the library may wish to restrict the amount of information displayed by using a reduced number of access points. The system, if required, will allow a reservation to be placed if the library copy is not available. Security features prevent unauthorised access to other library files.

4. Acquisitions

The URICA ordering process is broken into three separate operations, the sequence of which can be varied depending on particular needs. URICA allows the library to determine how these functions relate operationally.

* Holding checks
* Financial checks
* Order placements

URICA has the flexibility required for on-order materials and allows the library to set varying time periods or activity dates for follow-up. These criteria can be used to initiate reports to both the supplier and library.

All the usual accessioning functions are done on-line and URICA allows easy access to orders for the reconciliation of items supplied with items ordered. Invoicing data will cause automatic adjustment to the appropriate fund totals with allowances being made for the part supply of multi-volume and/or multi-copy orders.

5. Serials Control

URICA provides for comprehensive control of subscriptions for single, gratis and multiple copies of journals. These can be costed in whole to a department or the cost shared by the departments concerned. Exchange rate fluctuations are accommodated in commitments and costs allocated. Cancellations and re-orders are taken into account in the annual task of renewing all subscriptions, which URICA does by producing a review list, with forecast costs, and then the new orders for the next year.

Provision is made for circulating journals to departments and individuals. This facility will be extended to include the receipting of individual items, with the attendant claiming on non-received items.

6. Circulation

URICA can cope with the diverse circulation demands of libraries with the provision of multiple catgeories for borrower types, loan periods, fines, types of material, loan limits and library specific variables. There are no restrictions, except those determined by the library as being most suitable for its own needs. At any time, these categories can be added to, deleted from or changed.

The URICA Circulation module ensures ease of use, reliability and optimum response time for:

* Machine-readable identifiers
* Loans
* Renewals
* Returns
* Reservations
* Blocking of borrowers
* Overdue and recall notices
* Charges for late returns

URICA can link to external systems for:

* Library-to-library loans
* Reciprocal borrowing

* Interface to personnel files

In addition to the on-line information retrieval facilities, URICA provides a comprehensive set of printed reports:

* Statistics available for issues, enewals, returns and reseervations by various categories
* Blacklisted borrowers
* Reservations
* Missing or lost items
* Borrower additions or deletions
* Inter-library loans

7. Cataloguing

The URICA Cataloguing module reflects the great versatility of the system. It provides for a wide range of inputs - any MARC format can be accommodated. The way in which the system stores the data is dependent on how the library wishes to access records and what data it wishes to display in the various output format. URICA allows for a wide range of detail in original cataloguing and the library may decide if it wishes to use a MARC structured input for the original cataloguing process.

The URICA Bibliographic Database not only provides a powerful and economic storage/retrieval structure for cataloguing data, it also provides economies on the prouction and use of data. Data created by the URICA ordering process is available to ensure accuracy and consistency as it is controlled by the same authority structures.

SERIALS CONTROL : EBSCO

W. Philip van Zwam

EBSCO Subscription Services, which began in the United States in the 1930's, offers two systems which assist libraries in the task of serials control. These are EBSCONET and CHECKMATE. The company seeks to assist in the ordering, cancelling, claiming and searching of serials in libraries of all sizes and types. As the company now has branches worldwide, including Germany, Italy, Greece, United Kingdom, Taiwan, Australia, South Africa, Brazil and Canada, title coverage is extensive. Indeed, the database includes 206 000 titles presently, and is probably the largest in the world.

Customer libraries place orders for new titles with EBSCO, who then in turn order from the publishers or agents. EBSCO will then arrange for invoicing, send renewal notices and provide special reports. The system is fully automatic, which additionally allows for online interactive searching. Claiming and cancelling can also be executed in the same way, while hardcopies of these transactions are mailed to the user. All administrative details are updated every 24 hours.

The EBSCONET facility provides a user-friendly, cheap and efficient link between the library, and publisher or agent. Other services provided by EBSCONET include electronic mail, called TELMAIL. All EBSCONET members may communicate with each other, inquiring about title availability or sending personal messages. Any non-administrative communication with the EBSCO offices is also done through this facility.

EBSCO also maintains the only online inventory of back issues in the United States. This is called EBSCO Missing Copy Bank. Unneeded duplicates are listed in this database, which may then be requested in cases of emergency. EBSCO also provides computer-produced management reports. Routing can also be controlled automatically through EBSCONET.

CHECKMATE is a microcomputer-based serials control system which was developed by CLASS for internal library use. It can store up to 6 000 records, and has the following features:

- Keyword searching using Boolean operators
- Menu-driven programs
- Prompted data entry
- Formatted screens
- Sophisticated field modification techniques
- Accommodation of individual needs
- Variable field and record lengths
- User-defined field tabs, record print formats, and stop word lists

It handles the check in of each title, immediately recording when the title is to arrive in the future, so as to establish claim periodicity. At the same time a routing system may be established, so that the title in question gets sent to the right person. Titles are arranged automatically in alphabetical order.

The system also assists with acquisitions. It can track payment history, dates and amount, and provides renewal dates (anything other than 1 January). Outstanding issues can be highlighted. Claiming is done automatically, as the system has its own claim forms : it will highlight titles where claims are due according to information entered when the title was first added.

EBSCONET and CHECKMATE are complementary and may be used side-by-side. One may, however, use checkmate without being an EBSCONET user. EBSCONET is particularly useful in the larger libray, while CHECKMATE was designed specifically for the smaller library.

INTRODUCTION TO SOFTWARE PACKAGES : LECTURE NOTES

Ms N M LODDER

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INTRODUCTION

This lecture deals with software packages as opposed to locally written, or "homegrown" software. Homegrown software is generally written for a particular organization to suit its own individual requirements and is not intended for use by other organizations. Software developed as a package is, on the other hand, intended rather for wider use and not only for an individual organization. A package is therefore a set of programmes intended for use by a number of organizations and is generally available as a commercially marketed and supported software product.

Two types of software are used in computerized systems - support software and application software.

Support software is software which

* controls and supervises the processing which takes place in the computer and

* which provides general-purpose processing capabilities which can be called upon through simple instructions in an application program such as reading data from an input device and storing it in a database; or sorting a file of records in alphabetic sequence.

Support software is often very complex and the responsibility of specialist programmers and analysts. Librarians don't need to know any details concerning this type of software but need rather to be aware of the types of support software used and their function. An exception could be microcomputer support software as the end-user often has to be more self-sufficient when it comes to micros than is necessary for mini's and mainframes.

Application software differs from support software in that it is designed to carry out specific tasks for application by the computer user or end-user; application software makes use of the facilities provided by the support software.

In this lecture the more important types of support software are mentioned, and application software packages for libraries are discussed with particular mention of application packages in use in South African libraries. It should be noted that where specific software packages are mentioned in this lecture this is done by way of example; no attempt is made to provide a comprehensive or an evaluative list of software.

SUPPORT SOFTWARE

The following are some of the more important types of support software relevant to library systems.

i) Operating systems.

The operating system is the computer's master set of programs whose function is to supervise and control all of the computer processing which takes place in the computer.

There is no need to go into more detail about the available operating systems but of interest may be the names of the more important operating systems for microcomputers. These are

CP/M (Control Program for microcomputers) - for use on 8- and 16-bit microcomputers, developed by Digital Research Inc.

MSDOS - for use on 16-bit microcomputers such as IBM PC's, developed by Microsoft.

UNIX - for 16- and 32-bit microcomputers, developed by Bell Telephone Laboratories; can also be used on mini and mainframe computers.

ii) Time-sharing or communications control software.

Time-sharing support software provides for the simultaneous online interactive use from terminals linked to a computer. If the computer being used is powerful enough the time-sharing system should allow numerous computer users to access the computer from their terminals without being aware of each other; if it is not one will for example experience slow response times at the terminals.

The time-sharing software runs under control of the operating system. Most library systems now being used are online interactive systems and therefore make use of time-sharing support software. The SABINET system which runs on IBM-compatible computers for example uses CICS, one of IBM's time-sharing packages.

In microcomputer systems one doesn't usually have a large number of terminals linked to the computer and therefore special time-sharing packages are not often needed. On the other hand of importance can be support software which allows for communication, such as online transmission of data files, from a microcomputer to other microcomputers or to larger computers. An example of a library application requiring such a link would be one in which data on the library's loan transactions were

captured on a microcomputer system and these data were then subsequently transmitted directly from the microcomputer for storage and subsequent updating of the library's main databases on a mainframe computer. Examples of such support software are Crosstalk and 10 Net.

iii) Database management systems.

Database management systems are another particularly important type of support software. They were developed as the file and data handling required in programs became more complex and as increasing use was made of direct access storage devices such as magnetic disks.

In earlier programs the data was stored in files, often sequentially organized, which were set up for individual application programs. Much of the programming work needed to access the data in these files had to be included in the application program. This complicated the programming work and led to unnecessary repetition of program coding. It also resulted in duplication of data. For example, records on the names and positions of employees of an organization may be kept in a file for use by programs concerned with staff salaries and much the same information may be kept in the Library's records for use in its circulation system.

Database management systems resolve many of these problems. A database contains the various fields or items of data needed for a variety of programs and these data are stored in a central data pool - the database; the database management system therefore makes much of the computer processing which is involved in handling the data needed in application programs transparent to the application programmer - the application programmer need have only a "logical view" of the data in the database and of how it is stored and need issue only relatively simple instructions in his program in order to store, alter or access data in the database. The "physical view" of the data is a problem of the database management system itself.

A few well-known database management systems are ADABAS (and its associated query language NATURAL) - the SABINET system makes use of ADABAS; and DBASE III for microcomputers.

There are various other types of support software such as compilers, sort/merge utilities, file-copy utilities and so on but these will not be discussed here.

APPLICATION SOFTWARE

1. General purpose application software packages

Three types of general-purpose application packages should be mentioned as being of possible use to a library:

* Word-processing packages (e.g. Multimate and Word Star for microcomputers, ATMS for a mainframe) can be invaluable in the ordinary correspondence and report-writing administrative activity in a library.

* Spreadsheet programs such as VisiCalc and SuperCalc can also be used to advantage e.g. in producing statistics and in budgeting.

* Electronic mail packages which provide for the exchange of messages among terminals linked to a computer on which the package has been installed; could be useful e.g. where a library has several remote branch libraries and for communication between libraries regarding inter-library loans.

2. Software packages developed specifically for library applications

The developers of software packages

Over the last decade software packages developed specifically for library use have gradually come to the fore. The result is that there are now a number of such packages available on the market, some of them having been used successfully for some time.

Some background information about the developers of these packages can be of use in assessing the packages for possible implementation in a library as it can give an indication of the types of facility, the reliability and the likely lifespan of the package. The developers can be grouped into four categories:

* a commercial organization such as a computer company or software house; examples of library packages developed by this type of organization are URICA (URICA Integrated Systems), SCIMATE (ISI) and STAIRS (IBM)

* a commercial organization in conjunction with a library; an example is DOBIS/LIBIS developed by IBM in conjunction with the University of Dortmund library and the library of the Katholieke Universitat, Leuven

* a library or its parent organization which then subsequently gives the rights for marketing and maintenance of the system to a commercial company; an example is the Washington Library Network system, versions of which are now being marketed by a private company

* a library which then subsequently itself markets and maintains the system as a commercial venture; an example is the NOTIS package which was developed by Northwestern University, Illinois, for use in its library and which is now marketed and maintained by a division within the University which was established especially for this purpose.

As a generalisation one could say that for example

* where only a commercial organisation has been involved in the development of a system it would be as well to make sure that the staff in the organisation had some knowledge and understanding of libraries and their requirements

* where libraries were involved the size, type and status of the libraries would be useful indicators as to the type of system they developed.

* where a library is maintaining and marketing a system it would be as well to try and establish whether or not this is a permanent arrangement and to what extent it seems likely that the library will have sufficient resources to satisfactorily support the software.

Examples of library packages

Library software packages can be grouped into those which are integrated system packages and those which provide only for individual library functions. Integrated systems provide for more than one library function and make use of a single database shared by all functions. Functions provided for in integrated system packages are generally at least the functions of acquisitions, cataloguing, retrieval and circulation. Integrated library systems are dealt with in another lecture presented at the Workshop and will therefore not be discussed further here.

Another grouping of library packages can be made according to the types of library function for which they provide. This leads to a grouping into packages providing for what can be called library "management" or "housekeeping" activities which provide for such activities as acquisitions, cataloguing, retrieval and circulation and to retrieval packages which provide generally only for the retrieval activity.

Some examples of packages are the following:

Library Management Packages	Function/activity					Hardware type
	Acquisitions	Cataloguing	Retrieval	Circulation	Serials control	
SABINET	Yes	Yes	Yes	No	Yes	Mainframe
URICA	Yes	Yes	Yes	Yes	Yes	Mini
DOBIS/LIBIS	Yes	Yes	Yes	Yes	Yes	Mainframe, Mini
ALIS	?	Yes	Yes	Yes	Yes	Mini
LIS	Yes	Yes	Yes	Yes	?	Mini
Checkmate	-	-	-	-	Yes	Micro
PERLINE	-	-	-	-	Yes	Mini

Information retrieval packages

STAIRS	-	Mainframe
BASIS	-	Mainframe
DOCUMASTER	-	Mainframe
CAIRS	-	Mini
Micro-CAIRS	-	Micro
ASSASSIN	-	Mini, Mainframe
Micro ASSASSIN	-	Micro
SciMate	-	Micro
DataManager	-	Micro
Golden Retriever	-	Micro
Inmagic	-	Micro

As can be seen from these few examples, the systems range from those which require mainframe computing facilities to those requiring mini- or microcomputer facilities. Some systems have been developed for medium to large computers and subsequently scaled-down versions have been produced for use on micro's. Examples are the CAIRS and ASSASSIN systems. The facilities provided by these various packages differ considerably not only with regard to the computer hardware which they require but also with regard to the sophistication and comprehensiveness of the procedures provided for each library activity.

Each package has its advantages, disadvantages and peculiarities. When a library is evaluating a package for possible use, a package's capabilities will have to be assessed in relation to the requirements of the library concerned. What may be a disadvantage in a package in the view of one library may be an advantage in the view of another which has different requirements.

The James E Rush publications on computerized library systems are recommended to those requiring more details on the capabilities of various types of library system and for information on available packages.

CONCLUSION

Packages are now available which provide for a wide range of facilities applicable to libraries. In larger libraries integrated library system packages are being used to an increasing extent. These packages in themselves are generally complex and sophisticated and provide for extensive online interactive computing. These packages are in turn often dependent on sophisticated support software such as database management and time-sharing systems. All-in-all, therefore, these library packages add up to large-scale and relatively complex and costly systems. The use of these complex systems is, however, generally essential in order to meet the processing requirements of all but the smaller libraries. The microcomputer-based systems are, at present at least, used more in small libraries or in conjunction with larger mini- or mainframe-based systems or to provide specialised facilities, such as advanced retrieval facilities for a special collection of documents maintained by a library, which complement facilities provided by other larger systems.

With the wide range of packages now available on the market the selection of a package or of packages suitable for a particular library has become a difficult task. This aspect of selection is dealt with further in other lectures presented at the Workshop.

SUGGESTED READING

1. Chen, Ching-chih & Bressler, S.E. editors, Microcomputers in libraries. New York : Neal-Schuman, c1982.

2. Rorvig, Mark E. Microcomputers and libraries : a guide to technology, products and applications. White Plains, N.Y. : Knowledge Industry Publications, c1981.

3. Library systems evaluation guide. James E. Rush Associates, inc.
Volume 1, Serials control, c1983
2, Circulation control, c1983
3, Public Service
4, Acquisitions, c1984
5, Management Services
6, Interlibrary Loan
7, Cataloguing
8, System Integration

4. Genaway, David C. Integrated online library systems : principles, planning and implementation. White Plains, N.Y. : Knowledge Industry Publications, 1984.

5. Tedd, Lucy A. An introduction to computer-based library systems. 2nd edition. Chichester : Wiley, 1984.

November 1985

BUILDING YOUR OWN DATABASE

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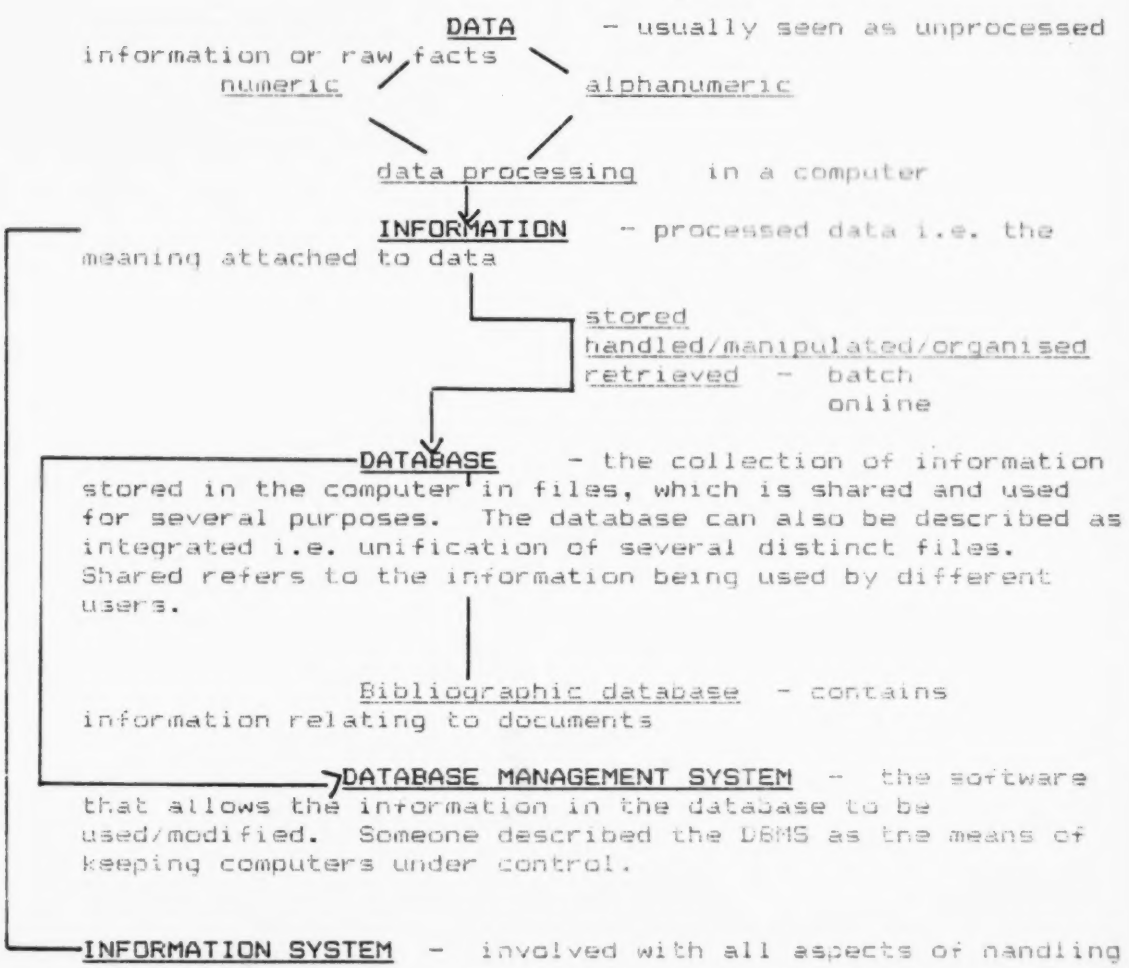
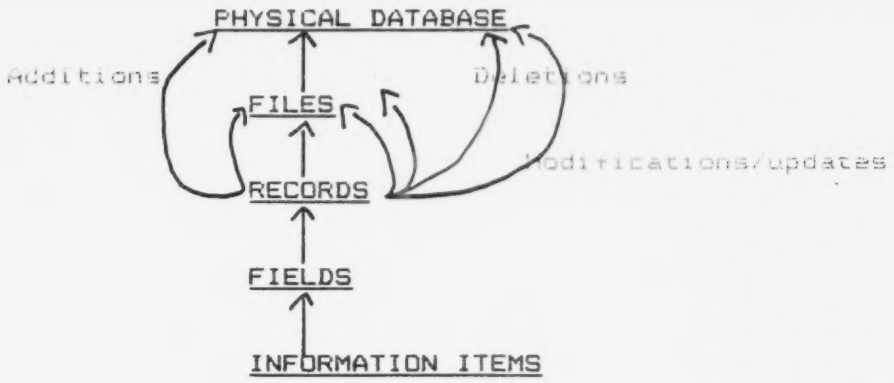
I would like to cover the construction, development and use of a database in the library situation. I have tried to keep it very general, but at the end, I would like to talk about our own database in ERI. You will realise that much of what I will say is based on my own experience in developing our database at the Energy Research Institute. I am working in a specialised subject area and my users are mainly researchers, academics and students.

I am not a computer expert. I use the computer as a means of providing the best service possible to my users within the limitations of the system available to us.

Before we look at the practicalities of designing and developing a database, I would like to try and clarify a few related concepts.

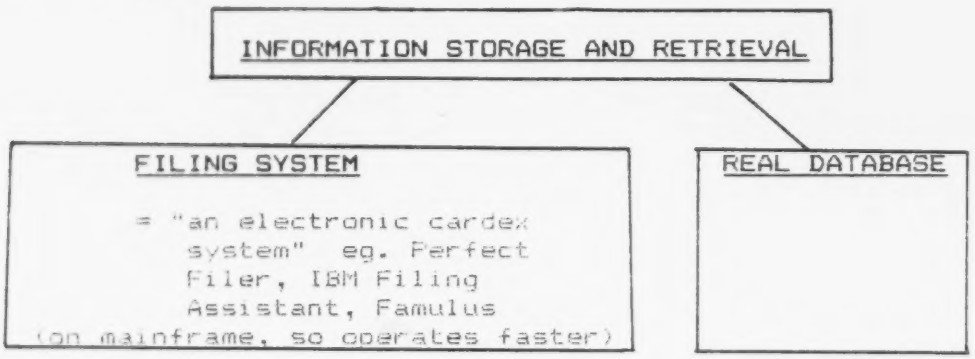

DATA - usually seen as unprocessed information or raw facts
numeric
alphanumeric
data processing in a computer
INFORMATION - processed data i.e. the meaning attached to data
stored
handled/manipulated/organised
retrieved - batch
online
DATABASE - the collection of information stored in the computer in files, which is shared and used for several purposes. The database can also be described as integrated i.e. unification of several distinct files. Shared refers to the information being used by different users.
Bibliographic database - contains information relating to documents
DATABASE MANAGEMENT SYSTEM - the software that allows the information in the database to be used/modified. Someone described the DBMS as the means of keeping computers under control.
INFORMATION SYSTEM - involved with all aspects of handling information

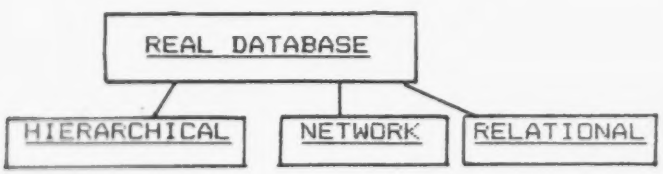
BEST COPY AVAILABLE



ITEMS OF INFORMATION are stored in FIELDS (fixed length or variable length) which together form RECORDS which, when collected together, are stored in FILES. The FILES are the collection of information held in the DATABASE for access or retrieval when required.

Databases can have various structures. Our bibliographic database will be used mainly for information storage and retrieval. We can distinguish between two types of systems for information storage and retrieval, namely,


INFORMATION STORAGE AND RETRIEVAL
FILING SYSTEM
= "an electronic cardex system" eg. Perfect Filer, IBM Filing Assistant, Famulus
(on mainframe, so operates faster)
REAL DATABASE



A real database can have 3 separate structures. Hierarchical and Network are not used much because they are cumbersome and complicated to use.

RELATIONAL DATABASES

- the simplest of all database structures
- stores lists (tables) of data
- ignores pointers
- looks for one-to-one relationships

Examples: DBase2
DBase3
Knowledgeman (KMan)

In this structure, using logical operators, the computer will search through the tables for a one-to-one relationship (linear).

In the Network structure, you have to do one search at a time, possibly each one more specific than the previous search. With a relational database, you can combine all your specifications by means of your logical operators into one search.

With regard to database structures, a rating of the efficiency and ease-of-use can be shown as follows:

3. Hierarchical

2. Networks

1. Relational

I am going to assume that you have access to computers - micro, mini or mainframe - and I do not want to discuss the pros and cons of the various types of computers. This, obviously, is going to affect what you can achieve and the performance of your system.

WHY DO YOU WANT TO BUILD YOUR OWN DATABASE?

* your subject field is unusual and other databases in this field do not exist
* you do not have the facilities to access international/national databases
* you have useful information which your users want to access easily and quickly on the spot

HOW TO START

* look at what you have
* decide what you need - your system must be developed in response to an identified need among your users

SOME QUESTIONS THAT YOU NEED TO ASK

* what are the OBJECTIVES of your library?
* who are your USERS?
* what TYPE OF SERVICE are you providing at the moment and what should you be giving
* how much MONEY is there available for database development?
* how do you see your database GROWING in the future?
  - is it going to grow
  - if so, by how much per year
  - is this growth going to be steady, slow or fast

* if you already have a database, for example, on cards, how are you going to INCORPORATE this, if at all
* STAFF/EXPERTS required
* do you need a micro, mini, or mainframe COMPUTER
* are you going to use an existing SOFTWARE package or develop you own (if the latter, do you have the expertise available, and how expensive or necessary is this going to be)
* do you need a BATCH or ONLINE SYSTEM or one capable of both
* do you have the SUPPORT of your USERS to implement your proposed system

Assuming that we are going to go ahead with the development of the database, it is good to bear in mind the following before we look in depth at designing the database

- is there going to be a database planning committee consisting of library staff, computer staff and users. Such participation at the beginning of the project is good.

- however, sometimes the librarian/information officer is told, "it's up to you" - minimum consultation with your users. In this case, you must still keep your users informed and listen to their criticism and recommendations. Ultimately, you are designing the database for them. Group concensus can be useful in resolving problems encountered.

DESIGN CRITERIA

What is your database going to contain and how is it going to be structured?

1. There must be a policy or guidelines as to the SELECTION OF MATERIAL and what subjects are going to be incorporated in the database. If it is a specialised area, there will be some overlapping of other subject fields.

Identify

core subject areas
peripheral subject areas

If there are already existing databases in the same field locally, try to minimise duplication of material through consultation with these other centres.

type of material to be included in the database

* monographs
* reprints
* journal articles
* conference papers
* pamphlets
* newspaper clippings
* maps
* microform
* audiovisual (films, slides)
* computer tapes

etc

Care must be taken in excluding articles, reprints which are usually considered too short. In ERI, a pamphlet is regarded as less than 4 pages and it is still indexed in as much detail as a monograph and added to the database. Newspaper clippings are not usually included in our database. These are stuck into scrapbooks with indexes in the front of the scrapbook and stored with the material under the particular broad subject area. (ERI does not use a classification scheme. Material is arranged under broad subject areas and analysis of the subject content is by means of keywords.)

Other source material to be examined

* publishers' catalogues
* trade catalogues
* reports (eg. annual reports, research progress reports)
* other databases
* abstracts
* indexes

These sources could lead you to valuable primary material for inclusion in your database.

2. INDEXING

There must be a policy on whether there is to be macro or micro indexing or both

3. DATABASE STRUCTURE

This must be flexible, and relates to the input and retrieval of information from the database. It also relates to the software package used.

Includes

* how your information is arranged in your database, how it will be displayed and printed (format), i.e. what options, fields do you want
eg. full record showing all fields
abridged record, showing selected fields
indexes such as, stop list, thesaurus

NB. The database must be structured in such a way that it is USER FRIENDLY.

4. SCOPE OF THE DATABASE

This relates to the size of your database., and you must decide on the following:

* will you include everything on your subject
* will you specify limitations, such as,

(i) time spanned - last 5 years, 10 years, no limit
(ii) geographical area - the world, regional, local
(iii) language - only English
(iv) type of material - academic, technical
(v) size of your records

5. RETRIEVAL

* controlled (thesaurus for indexing and as a search aid)
* uncontrolled/free language
* combination of both (with a choice)

6. Provision must be made for the MAINTENANCE of your database

* adding (inputting) new records
* updating (modifying) existing records
* deleting records

WHAT ARE YOU GOING TO USE YOUR DATABASE FOR?

- a source of information in your subject area
- your library's catalogue
- SDI for your users, using their information profiles to keep them informed with developments in their specific subject interests. This function can be linked to the use of a word processing package to produce abstracted information in the the subject area on a regular basis (eg. ERI PERSPECTIVE)
- linked to the previous point, showing additions to the database by printing out the latest entries in the various subject areas, and circulating this printout to your users.

Our database at ERI is known as ERI Energy and we use the Famulus documentation and retrieval system which operates on the University's mainframe. This is a batch operated system and the University has a timesharing system for its users.

At present, our database contains +7 000 records and is stored on magnetic tape. The subject field of the database is energy in all its aspects, and overlaps with engineering, particularly mechanical engineering, and economics.

With regard to our users, we have about 20 engineers and technicians on the staff of ERI. We also have 25 members of the ERI, which include oil companies, SASOL, ESCOM, engineering firms such as, John Thompson etc. UCT staff and students also have access to our database (mostly Mechanical Engineering).

As I have already mentioned, Famulus operates on the University's Sperry mainframe. We also have 5 microcomputers in ERI, which includes 2 IBM XTs. These are used for word processing, spreadsheets and database construction. The programs which are mostly used are XYWRITE II,DBASE 3, Lotus 1 2 3, and KMAN.

We have written a program for thesaurus construction, using KMAN which operates on an IBM XT and which needs a minimum 10 Mb hard disk. We hope that this thesaurus will eventually be built into the database so that it can be used for indexing and as a search aid when needed. This will not prevent using free language searching.

As a current awareness service, we produce the ERI PERSPECTIVE every 2 months for our members, our staff, as well as for the use of our Scientific Counsellors overseas and others in the energy field - 75 issues are printed. This consists of abstracted information on energy taken from journal articles, government press releases etc. Source articles are sometimes only half a column long. We have not incorporated these into our main database but have recorded them on 3 x 5 cards.

However, we have bought DBASE 3 and we are planning to put these into a separate database using DBASE 3. When more detailed articles appear on some of these topics, these are included in the main database.

These short articles do form important source material and we sometimes do write to the companies mentioned for more detailed information.

The ERI PERSPECTIVE also contains a conference calendar on energy-related topics. A separate conference calendar is also printed out and sent to other organisations who have expressed interest and who are not on the mailing list for the ERI PERSPECTIVE, such as, libraries, CSIR Conference Calendar, SABC TV's 50/50 etc. We also compile energy statistics of importance to South Africa and which are included in the ERI PERSPECTIVE. We are planning to expand this statistics section and publish it separately from the ERI PERSPECTIVE.

With regard to our main database, we index 150-200 items per month and we update and modify it regularly, printing out supplements of the latest additions. We do a complete update every 6 months. These supplements are sent round to all ERI staff.

Most of the current information on energy research is obtained from journals. ERI takes about 130 journal titles and we share 25-30 titles with the CSIR Energy Programme, and about 25 titles are routed to us from UCT Libraries.

This is a vast subject to cover in detail in the short time available. However, I do hope that this was of some practical use to you.

REFERENCES

1. BEAUMONT, J & KRUEGER, D (EDS.)
   Microcomputers for libraries: How useful are they?
   Canadian Library Association, 1983.

2. DATE, C J
   An introduction to database systems. Vol.2
   Addison-Wesley, 1983.
   (Good chapters on data models and relational databases)

3. ROWBOTTOM, M & TEMPLETON R
   Getting started: A guide to using the microcomputer in the library
   Special issue 1985 of Library Micromation News.

4. STIBIC V
   Personal documentation for professionals: Means and methods
   North-Holland, 1981.

5. ULLMAN J D
   Principles of database systems
   Pitman, 1980.

INDEXING TECHNIQUES IN DATABASE SYSTEMS

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Paper delivered at the workshop on "Computer applications in information systems", 26 November 1985 at the Ritz Plaza hotel , Sea Point, Cape Town.

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INDEXING TECHNIQUES IN DATA BASE SYSTEMS

1. ORIENTATION

It is commonly accepted that the aim of indexing is to to make information available, or to enable retrieval of relevant information. Indexing should reveal subject content so that retrieval or content identification will be possible.

For manual systems various indexing techniques were developed. Alphabetical subject indexes like the Library of Congress Subject Headings and Sears List of Subject Headings stands as examples ; or facet schemes like that of prof P.C. Coetsee, the Classification Research Group in Britain, and PRECIS (Preserved Context Indexing System). The literature over the years has thoroughly dealt with this subject, and the importance is underlined by the existence of indexing schools and workshops.

The basic concepts of these techniques were to determine the "best" content bearing index term (or terms) by analysis of the document or abstract. On average (and speaking in general) this produced three to five subject access points per document in larger systems or up to eight access points in smaller collections. Looking at mechanised non-computerized systems like Termatrex, we sometimes had a few more, but the physical format usually inhibited depth of indexing.

Today, in current, commonly available data base systems we find the same basic indexing techniques still in use. Looking at a record in many data base systems would not reveal much difference from conventional indexing systems, and retrieval would mainly be done through a controlled vocabulary or thesaurus. What then have we gained by going to the computer? Do we now only have another type of typewriter with better editing capabilities, or are we mainly interested in the high density storage capabilities? This is not true, as we have all expected so much more from this new meduim. What is true, is that for most systems, the indexing policy was not changed to take full advantage of computerised data base systems. Therefore we have to look for indexing techniques which would optimalise the capabilities of computers for information retrieval. To determine the best indexing techniques, we must first determine the capabilities of state-of-the-art data base systems.

2. CAPABILITIES OF COMPUTERISED DATABASE SYSTEMS

We have to be realistic and only take into consideration capabilities currently available in systems (in South Africa!). Capabilities of systems which will have an effect on indexing and retrieval are the following:

2.1 Record structure

The user has the facility to design the structure of the record by defining the fields of the record according to the characteristics of the document or item to be indexed.

2.2 Indexing

Indexing of data in data base systems, is generally done in two distinct ways:

- string indexing
- word indexing

A "string" in this sense is any series of characters in a record.
A "word" is any series of characters between two spaces.

Most existing systems can do full text word indexing (indexing all the words in a given text). Stop lists are often applied to eliminate non content-bearing words from text.

2.3 Comparisons

- Mathematical : comparing strings using mathematical expressions like greater than, greater and equal, equal, less, less and equal,and from.....to.
- Alphabetical : comparing strings or words with each other (to determine whether it is the same word or not).

2.4 Truncation

The ability to look for a particular string of characters as part of a word. Most systems can only do suffix stripping, which in English is the most common need.

2.5 Boolean co-ordination

Identifying co-occurrences of words or strings (Boolean "and"), defining common sets ("or") and defining exclusive sets ("not").

2.6 Sorting

The ability to produce a rearranged set of documents in the database. From the same database you could have output sorted in alphabetical or numerical order. It is common to be able to sort according to the data in a given field in the record structure which would enable the user, for instance, to have an alphabetically sorted author output in one case and in the next a numerically date-sorted output.

3. INDEXING TECHNIQUES IN DATABASE SYSTEMS

With the capabilities of computerised database systems in mind, we now have to consider how indexing should be done. It should be mentioned that fully interactive search systems are envisaged here with all the functions available in online searching, and not just a computerized database for producing printed catalogs.

3.1 Post Co-ordination

Post co-ordination of terms is contrasted to pre- co-ordination. In pre- co-ordinated indexing the facets of a subject are co-ordinated into an index term or descriptor during the indexing process. The building a DDC classification number is an example of pre- co-ordination. Post co-ordination is the co-ordination of terms during the searching process, usually using Boolean logic. Post co-ordination enables the searcher to combine search terms much more true to the user's needs, but this method can only be really effective in systems designed to do just that. The computer is the first indexing medium that enables us to do high-level complex post co-ordination through the use of Boolean logic. Indexing policy should completely steer away from complex pre- co-ordination of faceted index terms. The aim of indexing should be to identify all content-bearing aspects of documents or items to be indexed, and to use that as document representations. In manual systems the total amount of terms in the system had to be limited to due to physical constraints. The computer has the ability to work with high volumes, accurately, and at speed, so lets use it in complex Boolean search statements.

3.2 Exhaustivity

Lancaster (1979 p193) defines depth of indexing as:

> "a measure of the extent to which all the distinct subjects discussed ..... are recognized in the indexing operation and translated into the language of the system."

As mentioned above, physical aspects limited the size of index vocabularies, and limited the total amount of terms per document too. In computer systems we index to a much greater depth not only because of the the computer's ability, but also to enhance the performance of the system. More terms per document would also better the results obtained by post co-ordination. The depth of indexing aimed at should be in a direct relation to the size of the system: larger systems would be able to handle more than smaller systems, but manual systems should not be taken as a measure. In most successful database systems inverse dictionary files are used for indexing. Searching (and Boolean co-ordination) is done in this file and not in the document file, so that the search time is pro-

portional to the size of indexed vocabulary, and not the size of the document file. For all practical purposes it is almost instantly in most systems - even microcomputer systems.

According to the definition maximum exhaustivity can be obtained by indexing all the distinctive information units in a given document. This can be achieved by indexing the full text of the document: and for the first time in the history of indexing this can be achieved, and is done in systems like NEXIS.

Greater depth of indexing (exhastivity) improves both recall and precision Recall is improved due to the higher chance of a hit in a document because more terms are available for searching per document. Precision is improved because the index vocabulary is natural language terms and therefore more specific (Lancaster 1979 p284).

3.3 Natural Language Indexing

Natural language indexing implies the use of uncontrolled (free) terminology for indexing, also known as free text indexing. The terminology used for indexing is not normalised, and results in higher specificity of index terms (Lancaster 1979 p284). Specificity of an index language is its ability to define or describe subject matter precisely (Lancaster 1979 p187) Indexing more exhaustive allows the indexer to use more terms per document , and this is for instance where natural language terms could come to their right alongside controlled terms (like done in INSPEC), or on its own. Lancaster (1979 p287,288) mentions the successful results of what he calls "hybrid systems" where a combination of a broad term controlled vocabulary is used with natural language. The controlled vocabulary forms a kind of overall superstructure (to enhance recall performance) and natural language terms are used to enhance precision because of its ability to describe precisely the subjects it deals with.

The availability of truncation as a searching aid allows for less control of index terms and gives the indexer more flexibility in the use of compound terms or subjects, or even natural language phrases. Whereas natural language improves specificity and therefore precision, truncation gives higher recall performance, because it broadens the term definition. These two techniques used in conjunction, really improves the results because it manipulates both recall and precision.

3.4 Record structure

In manual systems the lay-out of the reference had no direct bearing on the retrievability of that document. In database systems it is possible to improve precision by limiting the context of the search term by searching a term only within certain fields of the record. Therefore the designing of the record structure (the fields and subfields of a record)

should take the information need and the framework of the subject matter very specifically into consideration.

In systems where word proximity searching is possible, record structure design should be given even more thought to optimalise this feature. The IBM Stairs system is an example.

Sorting the content of databases are usually done by prescribing the sort to be done according to data in a certain field of the record structure. Designing record structures should therefore anticipate probable output formats.

3.5 Stop Lists

Because stoplists inhibit the indexing of certain words, it has a direct effect on information retrievability. Indexing policy should take the stoplist into account, and the design and maintainance of stoplists should preferably be in the hands of the indexing organisation, and not just a list drawn up by programmers of the system. Automatic indexing has shown the importance of words in a specific database, and this fact should be taken care of specifically in working with stop lists.

3.6 Co-ordination of Functions

One only realises the full capabilities of computerized information retrieval systems when you grasp the fact that most of the retrieval functions can be activated simultaneously. This is unique to this type of information retrieval system, and gives the user a very demanding and precise tool. It is common searching practise to truncate almost all search terms and include all synonyms (and quasi-synonyms) to improve recall performance. To counteract a bad precision performance of the same search term co-ordination is done by the Boolean "and" operator and by limiting the occurrence of terms to certain fields in the record structure. But the searcher is inhibited by the limits that the record structure designer puts to him, the data that the indexer gives him to work with, and the searching functions available in the software.

4. Conclusion

Indexing in interactive computerized database systems requires different techniques to what was used in manual systems. It is mainly the interactive searching capabilities of computerized systems that requires the different approach, but one has to deal with the differences in a positive and conscious way. It requires a new look at the items to be indexed, at the analysis of content, at the way in which information is to be offered to the searcher: in short a whole new philosophy of indexing.

REFERENCE

LANCASTER F. W. INFORMATION RETRIEVAL SYSTEMS 2nd ed. 1979
John Wiley.

APPLICATIONS OF TELECOMMUNICATIONS AND NETWORKING

Sue Bleimschein

As the title of this paper indicates, the emphasis here is on the applications of networks within information systems. Other aspects of networking. such as typologies, configurations and channels of communication are described elsewhere within these proceedings.

The concept of networking has been discussed farily comprehensively in the library literature during the last two decades or so, and library networks have been regarded by some as a special kind of animal. Various cooperative library arrangements, such as consortia, for example, have been called networks. Here reciprocal agreements allow for shared circulation privileges, acquisitions policies and storage for little used materials. This type of network need not use any type of Information Technology (IT).

It is therefore probably necessary at this point to make clear what is meant by the term "network". In a very basic sense, a network describes a series of inter-connected nodes - like a net - which does not neccssarily involve computers or telecommunications at all - such as the consortia just described. When computers penetrated the library world in the 1960's, more elaborate networks emerged in North America and the United Kingdom. These networks allowed the resource of computers to be used by members, as well as the facilities of these computer systems. These networks were used initially primarily for centralized or distributed cataloguing. Other functions, such as ILL, followed shortly, enabling the further sharing of library materials. Resource-sharing, in its broadest sense, was a primary objective of these early library networks.

There is now a diversity of types of networks. According to one principle of division, related to technology, there are two types of networks : computer networks, wherein two or more computers may communicate with one another, using a range of communication channels (coaxial cables, fibre optics, satellites and so on); and telecommunication networks, such as telephone, telex, teletext, and so on, where once again a variety of channels may be employed. There are also networks which allow for the cheaper use for these telecommunications channels, especially when transmitting digital information. These are sometimes referred to as Value-Added Networks (VANs).

It is interesting to observe in this connection that as long ago as 1980, the United States Federal Communications Commission ruled that it was no longer possible to make a distinction between where data processing ended and telecommunications began, such has been the convergence between these technologies. By the same token, we can no longer separate information resource management and telecommunicatons.

It is probably most useful in this context ot distinguish between networks according to function, describing in particular those which may be used by libraries and information centres. These include the following types:

1. Communications networks, where channels for communication of data and information are provided, and no databases are involved. These networks facilitate communication between humans or computers.

2. Information retrieval networks, where remote access to a centralized database is facilitated by vendors (eg DIALOG) and communications networks. Here the information contained within the database may not be modified by end-users.

3. Bibliographic utilities, such as SABINET and OCLC, which facilitate various cooperative resource-sharing activities, not least of which is cataloguing. Here members may modify the database, specifically by the addition of new data. These networks may also allow for the transmission of messages between libraries, for example in order to carry out ILL requests. These networks also clearly make use of the communications networks.

4. Service brokers, which, as their names often indicate, are also called networks, such as NELINET or SOLINET, in the United States. Here libraries form groups, which then purchase services from a bibliographic utility on behalf of their members. A group may additionally offer other services to its members.

5. Cooperatives and consortia. These formal arrangements which facilitate resource-sharing are described above.

6. Intralibrary networks are more familiarly known as integrated library systems, as they allow for the exchange of information between departments. Local Area Networks (LANs) also fall within this category, and may be used for the communication of data between departments or branches.

7. Booksellers' networks such as Blackwell's NA allow document ordering and delivery services. Periodical subscription services such as those provided by EBSCO or FAXON (LINX) may also be included here.

8. Management information networks. The term is self-explanatory.

Other types of networks, such as automatic banking, videotex, and teletext also have a role to play in libraries and information centres. Usually, however, networks that are used by libraries, or that may be called "library networks", exhibit the following characteristics. They

- have a cooperatively built and maintained database, which is remote from the user library, and therefore links user and data/ facilities.
- require a communications system of facilities
- have definition; the boundaries are clearly demarcated.
- require a significant level of financial and organizational commitment form participants or members
- are based upon agreement within the group of participants or members that specific tasks should be performed and specific guidelines and standards adhered to.

This brief description perhaps does not fully describe the multitude of uses and applications within this environment. The point has already been made that information managers are concerned with at least three major types of information : published information, information about this information (or bibliographic information) and organizational information (personnel, funds, correspondence, and so on). The applications of telecommunicatons and networks may be dealt with in these three categories.

Published information

Most information managers, most of the time, deal with or control published information, or information in the public domain. This factor is probably the single most important disctinction between librarians, and records managers or data processors. These latter would appear to deal predominantly with information generated by, and mostly intended to stay within, an organization. Libraries and information centres may also act as publishers, usually disseminating information about themselves, for example the catalogue.

Of this publicly available information, some is now being published in electronic form only. Amongst the earliest examples of electronic publishing are the bibliographic databases, which are basically abstracts and indexes in electronic form. Access to these is provided via the information retrieval networks. Major advantages are that, by employing the capabilities of the computer, one can search these databases using sophisticated techniques such as Boolean logic and truncation. For several libraries, especially in North America, this is cheaper and more effective than buying, storing and using the hardcopy versions.

Since then other types of information have become available electronically. These include the full text and numeric databases, the Bible, journals, textbooks, encyclopaedias and other reference type materials. General information is also available to the less sophisticated user via telephone and monitor (BELTEL) and television (TELEDATA).

While all the information stored in this way is theoretically as available to and end user as are books, in practice this is not always the case, because of lack of skills and equipment on the part of the end user, not to mention cost. Librarians or information professionals are still called upon to search this information. BELTEL and TELEDATA will probably have deeper market penetration, but a television set and telephone are still prerequisites. Telefacsimile too opens up a wide field of possibilities for the exchange of information. Libraries could act as system providers or intermediaries here, facilitating access to these information resources.

Information about information

This is the kind of information most usually contained in the library networks mentioned previously. An example of this kind of information is found in catalogues, which include both bibliographic and location information - location in the physical sense. Both centralized or distributed processing, or a combination, may be used. SABINET is useful here, as well as offering other services.

At the local or regional level, similiar networks might also evolve. Imagine for example a public library with its Head Office doing centralized processing on behalf of a number of branch libraries. The central database at HO could contain descriptions of all titles, with location codes, and the relevant sections of this, by location code, could be distributed to the branches. These files may then be used as a basis for the branches' activities - circulation, overdues, waiting lists, requests and so on - and could additionally be searched by users as an Online Public Access Catalogue (OPAC). Staff could access the central database to serach for items not held at the branch, facilitating interbranch loan, where HO would be informed, but not involved. New stock could be added at HO; circulation figures could be sent through to HO for more accurate reporting.

The interchange of this type of information can take place through dial-up lines and modems - and "intelligent" modems will allow this to take place after hours as well. LANs might also be used here.

Organization information

Included in this section is management information , by which, in the library context, is meant circulation figures by title or subject area, or other characteristic; acquisitions, by fund, account, or other characteristic; number and type of online searches; personnel files, including salaries, grades, leave, and so on. This information needs to be stored and processed, as well as being analysed, and reports being produced.

Additionally, inter-office and inter-library communication can be facilitated by electronic mail. This can happen now even internationally, with the appearance of ALANET. Teleconferencing is also important here, especially as regards widely distributed committees of policy-makers.

Up to now the discussion for the most part has centred on libraries going out, or beyond their walls, to their users, or to assist their functioniong. The possibility also exists for users to "come in" electronically. Users can search a library's catalogue from home or the office, and possibly even place a request using electronic mail.

There are two major factors which make networking desirable, if not necessary.

- Economics. Using telecommunications and networking technologies, we can share and distribute resources of various kinds, including physical manifestations, such as books. Resources of all kinds are shrinking, not only in size, but in quantity. It is cheaper to travel telephonically, especially in transmitting electronically stored information. The distinction between the resources owned by an institution, and those not owned, will become increasingly blurred to the user.

- Service. We can improve the quality, quantity and range of information services - not to mention speed and possibly cost. We must not be oblivious to societal changes; people expect more, and more quickly. Our users encounter many automated services already, and may wonder why libraries lag behind.

There are still many issues to be discussed in this scenario, where by and large the technology and infrastructure already exists. Some of these issues are security, copyright, policy and management, privacy, cost, time, reliability, speed, protocols, accuracy, and that fiend standardization. Standardization here involves compatability between equipment, programs, and protocols or the development of interfaces.

As always, there will be de jure standards, laid down by ANSI and Z39 (now NISO), and the de facto standards, used by companies such as IBM and DEC. The ISO is currently completing an important standard called OSI - the Open System Interconnection. This is being used in the United States in their Linked Systems Project (which connects WLN, RLIN and LC). We seem to be moving gradually towards a nation-wide information utility, or network of networks.

Libraries and information centres of all types will certainly not remain untouched by these developments. Advances here will mean, at least, new organizational structures and procedures, and undoubtedly new services being offered to our users.

SAPONET : DESCRIPTION AND DEVELOPMENT

Americo da Silva

1. INTRODUCTION

SAPONET is a public switched data network operated by the South African Post Office and its main function is to convey digital data.

Before the advent of Saponet telecommunication circuits were used for data transmission in the two configurations of point-to-point (of which multidrop or multipoint is a variation) and dial-up (via the public switched telephone network).

Data transmission via the public telephone network is subject to some constraints such as underutilization of many voice grade circuits, bit rate limitations of the switched network and long time delays in setting up the telephone call prior to the start of the data transmission process.

In many applications the use of a separate data network results in appreciable economies for both the user and the network provider.

Saponet consists of switching centres known as Data Switching Exchanges (DSE's) or nodes in Pretoria, Johannesburg, Durban, Port Elizabeth, Cape Town and other main centres. In addition, there are multiplexors, X25 concentrators and Triple-X PADs in many smaller centres that do not perform any switching function but provide an economical means of connecting data users in these and adjacent towns to the network.

The DSEs and remote multiplexors are connected to one another by wide-band 48KHz trunk circuits operating at bit rates of 144, 128 and in some cases 64Kb/s.

A primary Network Control Centre for circuit switching is co-located with the DSE in Cape Town, whilst a back-up centre is co-located with the DSE in Pretoria. For packet switching a converse arrangement exists.

Saponet is not a homogeneous network, it is divided into two main networks known as Saponet-C and Saponet-P providing circuit and packet switching facilities respectively. The first was established in March 1979 and the latter in February 1982.

2. CIRCUIT SWITCHING FACILITIES IN SAPONET-C

Saponet-C consists of a number of overlaid subnetworks that operate independently of one another in that each has its own switches and multiplexors and set of trunk circuits. There is no interconnection between subnetworks, although this could be provided if required, and the number of subnetworks is increased from time to time to cater for expansion.

Circuit switching can be defined as the allocation of a discrete communication path between two users, for their sole use, for the duration of their call. The communication path may comprise an actual pair of wires or a set of time slots in the

scanning pattern of a time-division multiplexor or a mixture of both.

2.1. DATA RATES SUPPORTED

Saponet-C supports all the standard bit rates up to and including 9600 b/s, with the bit rates up to and including 1200 b/s being used for asynchronous working and those from 1200 to 9600 b/s for synchronous.

Any standard code can be used, but asynchronous users can only use an even-length code having not more than eight bits per character, including a parity bit, if used. Echoplex facilities can also be provided for asynchronous operation.

2.2. PERMANENT VIRTUAL CIRCUIT (PVC)

The PVC is the Saponet's equivalent of a leased line. It provides service between two users only, but provision is made for polled multi-drop working as in leased line working. In a PVC The users are allocated appropriate time slots permanently reserved for their use, and do not have to follow any protocol for setting up a call.

The advantage of PVC over leased line working is one of economy, since PVC working enables the use of baseband modems which are far cheaper than their analogue counterpart.

PVC working between two users served by the same DSE is not allowed (except as part of a polled multi-drop scheme) since the combined lengths of the access circuits will not be less than that of a leased line connecting the two users directly.

2.3. SWITCHED VIRTUAL CIRCUIT (SVC)

This method of working is intended as an alternative to data transmission vial the public switched telephone network (PSTN) and can be supplied at all the bit rates mentioned above.

In SVC working, a transmission path is set up only when required and a SVC user may communicate with any other compatible SVC user within the limitations of the closed user group scheme, which is applicable to SVC only in the circuit-switching services. A prospective user, on applying for Saponet SVC service, may nominate the other users with whom he wishes to communicate, and the port numbers or addresses are stored in the DSEs concerned. When a user originates a call, the number of his user group is transmitted to the destination DSE, which comparaes it with the group number of the called user. If they agree, the call is connected. A user may belong to more than one group, so that controlled communication between groups is possible.

The call setting-up procedure is different for the asynchronous and synchronous users. In the case of asynchronous data terminals with keyboards, the calling user sends the routing digits (typically 10 digits) from his keyboard and receives any

service signals as hard copy.

Because of the variety of line protocols used in synchronous data transmission, an SVC user who has a synchronous data terminal is obliged to make use of a Remote Terminal Interface Unit (RTIU), in addition to the modem. The RTIU is connected between the modem and the user's terminal and has a small key-pad from which the routing digits may be entered. It also has a single-character display to indicate the progress of a call.

2.4. FIXED DESTINATION SWITCHED VIRTUAL CIRCUIT (FDSVC)

FDSVC has been designed to cater for users who work to one destination only but do not have a large enough volume of data transmission to justify a PVC service, and is also well suited to cases in which a number of terminals must communicate with a port or group of ports of a central computer.

It is a SVC service in which the address of the user with whom the caller wants to communicate is permanently stored in the DSE on configuration. To initiate a call, the caller indicates a call bid by switching the RTS interchange circuit of the data modem on his premises to the ON condition. The DSE then generates the necessary routing digits to set up the call. The call is cleared down by restoring the interchange circuit to the OFF condition. If not already available on the terminal, the Post Office will install a switch to control the interchange circuit.

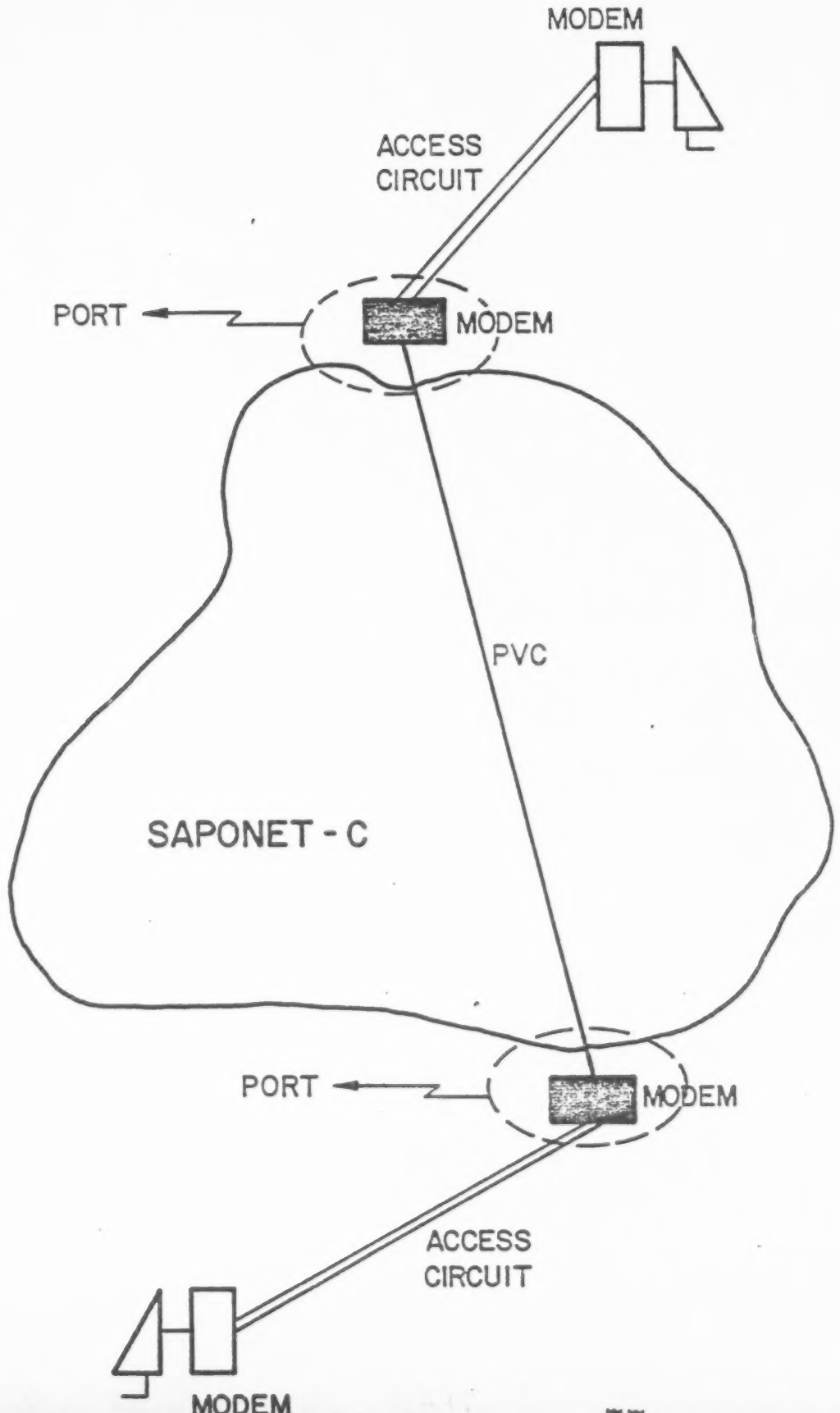
The procedure is the same for both synchronous or asynchronous users.

A FDSVC user may receive calls from FDSVC or SVC users and the SVC arrangements for hunt groups of ports are also applicable to FDSVC.

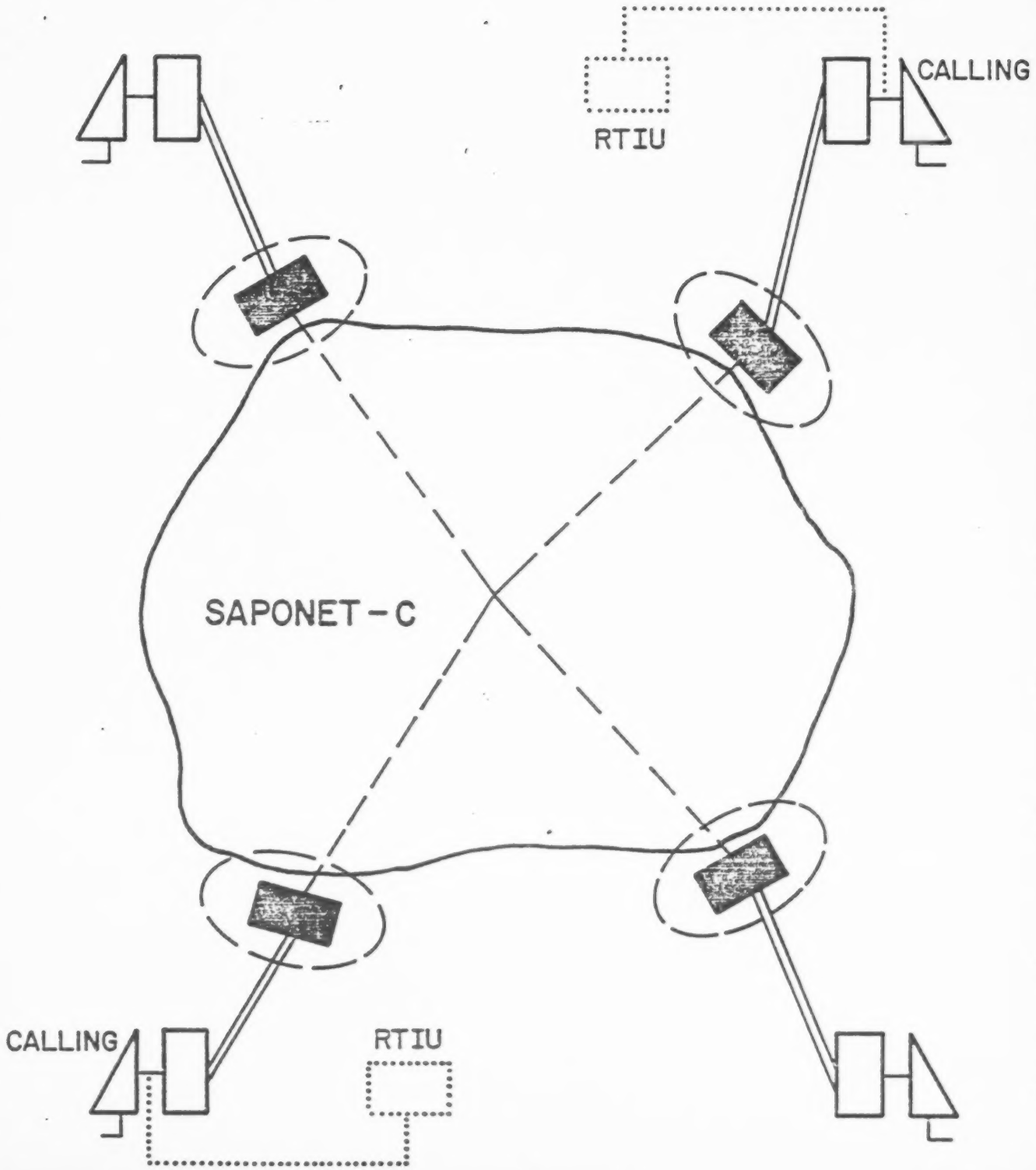
3. PVC WORKING VERSUS FDSVC WORKING

In straightforward point-to-point applications PVC and FDSVC are alternative solutions, and there is little to choose between them in convenience of operation. Since a PVC service is billed by charging a fixed distance-dependent amount per month, irrespective of the amount of use made of the service, and the FDSVC charges are dependent on the amount of use, it follows that there is a break-even daily utilization of the FDSVC service that will lead to the same charges per month as the PVC service. If the actual daily usage of the service is less than the break-even usage, FDSVC will be the more economical solution; if more, PVC will be the cheaper. The break-even daily usage varies from one SAPONET route to another, and from one bit rate to another.

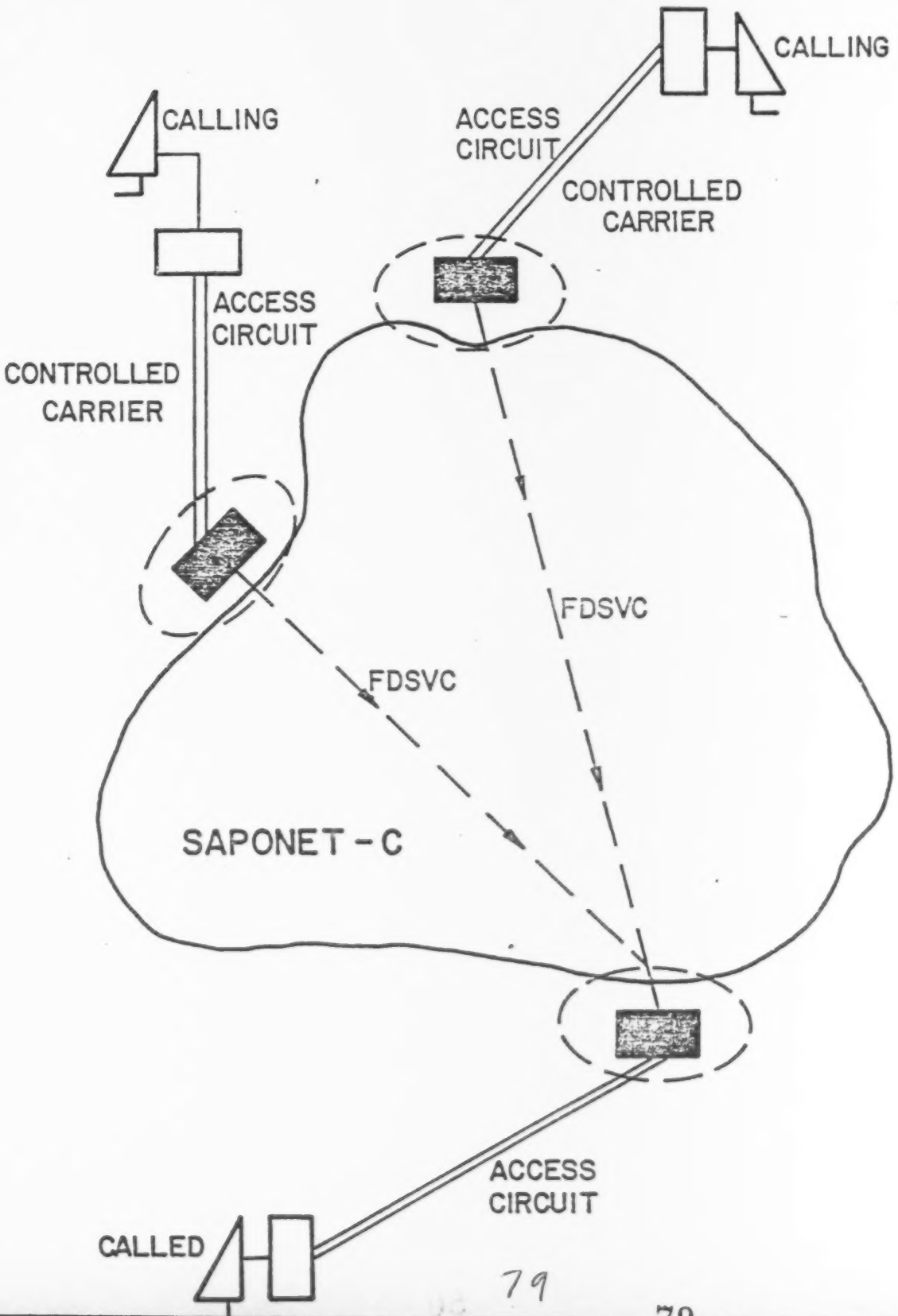
PERMANENT VIRTUAL CIRCUIT (PVC)



SWITCHED VIRTUAL CIRCUIT



FIXED DESTINATION SWITCHED VIRTUAL CIRCUIT



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THE PACKET SWITCHING FACILITIES OF SAPONET-P

SAPONET-P is a homogeneous network and all users thereof can communicate with one another if required.

Packet-switching is a method of operating a switched data network as an alternative to the circuit-switching method described earlier. Its main advantage is economy, resulting from the greatly increased efficiency of a network when operated in the packet-switching mode. Other advantages are: elimination of transmission errors by a system of error detection and recovery and automatic re-direction of traffic when a trunk becomes overloaded or inoperative.

A packet switching communication link may be thought of as a single channel terminated in two statistical time-division multiplexors with a group of bytes, known as a packet, forming the unit of multiplexing.

Since the packets from a number of information sources are interleaved in a random order, it is necessary to be able to identify each packet as part of a particular transmission. This is done by prefixing each packet with an identification. A packet, complete with its identification and control prefix, a suffix added to effect error control, and flag signals to demarcate the beginning and end, is known as a frame.

Saponet supports two types of packet-switching access, known as X25 and Triple-X. The main differences between the two methods as they are implemented in Saponet, are as follows:

X25 caters for all user bit-rates up to and including 64Kb/s. The operation of the access circuit is always synchronous, at bit-rates from 2400 b/s to 64 kb/s, but asynchronous terminals terminals may be supported by carrying out synch/asynch conversion in the PAD. Triple-X caters for synchronous operation only, at bit-rates up to and including 1200 b/s.

In X25 working a packet assembler and disassembler (PAD) or similar function must be provided at the user's premises; in Triple-X a common PAD is provided, either at a DSE or at a remote site connected to a DSE.

In X25 working access to the switched network is gained by an access circuit in the form of a leased line connecting the PAD on the user's premises to a port in the DSE. Leased line access is also used in Triple-X but, optionally the user may gain access to a port of the PAD at the DSE by dial-up via the public switched telephone network (PSTN).

In X25 working the transmission is error-protected from one user's premises to the the other, whereas in Triple-X the access circuits (leased lines or PSTN paths) are unprotected.

X25 takes its name from Recommendation X25 of the CCITT which describes an access protocol to the switched packet network. X25 employs the High-level Data Link Control (HDLC) line protocol which may be used for other types of synchronous data

transmission.

Triple-X takes its name from three CCITT recommendations, X28, X3 and X29, which describe respectively the protocol between a user's asynchronous data terminal and the common PAD at the DSE, the functions of the PAD, and the protocol between the PAD and the destination PAD, which may be a common PAD at a DSE or a X25 PAD at a user's premises. An X25 PAD may consist of a free-standing item of hardware, or of software in the front-end of a mainframe computer, or it may be incorporated in a packet-mode data terminal.

The various configurations of X25 and Triple-X are shown in Figure 4 .

It is a characteristic of packet switching that, because of the storage and re-transmission of frames en route, the time taken for a packet to traverse the network from PAD to PAD is a function of the volume of data being transmitted via the route followed by the packet in question. In SAPONET a maximum transit time of 1,25 seconds at 90% traffic loading is ensured.

5. TYPES OF SERVICES PROVIDED ON PACKET SWITCHING

SAPONET provides two types of X25 services: Virtual Call and Permanent Virtual Circuit. The packet switching version of PVC closely resembles, in concept and operation, the Fixed Destination Switched Virtual Circuit (FDSVC) service provided by circuit switching. The Virtual Call service is analogous to the Switched Virtual Circuit (SVC) of circuit switching. The destination address, i.e. the port number of the called user, is inserted by the terminal or computer port, and is included by the PAD in a call request packet that initiates the setting up of a call. The path of the message is set up by the originating DSE, intermediate DSEs (if any), and the destination DSE in accordance with the information in the call request packet. All the the information packets and control packets associated with the call request packet follow the same route. PVC service is essentially point-to-point; the destination address is permanently stored in the memories of all the DSEs concerned. No call request packet is therefore necessary; any information generated by the data terminal or computer port is simply packetized the PAD and sent to the DSE, where it is routed via the predetermined path.

6. THE PAD AND ACCESS CIRCUIT

A packet assembler and disassembler may be divided functionally into two areas:

1) The DTE part, facing the data terminal(s) or computer port(s).

2) The X25 part, facing the DSE port, to which it is connected by an access circuit terminated at each end in a data modem.

The DTE part of the PAD must be adapted to the terminals or

computer ports to which it is connected in respect of bit-rate, mode of transmission (synchronous or asynchronous) and message protocol.

For this reason the responsibility for providing and maintaining a PAD, or PAD facilities, rests with the user and not with the administration operating the packet-switching network.

Although the access circuit is operated synchronously, the terminals served by a PAD may be asynchronous, or a mixture of synchronous and asynchronous. Where necessary, the bit-rate conversion and synchronous/asynchronous conversion are carried in the DTE part of the PAD.

The functions of the X25 part of the PAD are chiefly:

a. Packetizing the information received from the DTE part of the PAD Before transmission via the access circuit.

b. De-packetizing the information received from the access circuit before passing it on to the DTE part of the PAD.

c. CRC error control.

d. The generation of call request and other functional packets as required, and responding to them.

The maximum number of logical channels per access circuit is 1023. There is no simple relationship between the number of terminals (DTEs) served by a PAD, the number of logical channels, and the bit-rate of the access circuit, since the bit-rates of the individual DTEs, their duty cycles, and the response times that are acceptable to the user must be taken into account.

7. USER FACILITIES

The facilities supported by SAPONET-P are:

7.1. Non Standard Window Sizes

This is agreed upon at the time when the user applies for service. It provides for the selection of default window sizes from one to seven. Values of window size other than the default size may be negotiated by the user for a particular virtual call by means of the flow control parameter negotiation facility. In the case of a PVC service, the window size must be agreed upon at the time of application for service.

7.2. Incoming Calls Barred.

This facility is agreed on at the time of application for service. It prevents the DTES concerned from receiving virtual calls, but allows them to originate such calls.

7.3. Outgoing Calls Barred

This is the converse of 7.2. and is agreed on at the time of application for service; it is applicable to all the logical channels, and prevents the DTEs from originating virtual calls, whilst permitting them to receive calls.

7.4. One-way Logical Channel Outgoing

This facility differs from 7.2. only in that it can be applied selectively to individual logical channels, instead of to the entire complement of logical channels of the DTE/DCE interface.

7.5. One-way Logical Channel Incoming

This differs from 7.3 only in that it can be applied selectively to individual logical channels.

7.6. Closed user group

This user option is applicable to virtual calls only and is agreed upon at the time of application for service. Participation in a closed user group permits DTE's to communicate with one another within the group, but prevents communication with DTE's outside the group. It should be noted that SAPONET's implementation of the various closed user group facilities does not make use of the user facilities field. Instead, the required information is contained in the address structure, i.e. the closed user group that the calling DTE wishes to access is indicated in the called address.

7.7. Closed User Group With Outgoing Access

This user option is also applicable to virtual calls only, it is agreed upon at the time of application of service, and enables a DTE to belong to one or more closed user groups, as well as enabling it to originate virtual calls to DTE's in the open part of the network (i.e. DTE's not belonging to any closed user group), as well as to DTE's having the incoming access capability described in 7.8.

7.8. Closed User Group With Incoming Access

This is the same facility as that described in 7.7, with a capability to receive virtual calls substituted for the ability to originate them.

7.9. Bilateral Closed User Group

This user option is applicable to virtual calls only, is agreed upon at the time of applying for service, and permits a DTE to belong to one or more bilateral closed user groups, such a group

being defined as one which permits a pair of DTE's, who have bilaterally agreed to communicate with each other, to do so, but precludes communication with any other DTE's.

7.10. Bilateral Closed User Group With Outgoing Access

This user option differs from that described in 7.9 only in that it additionally permits a DTE to originate virtual calls to DTE's in the open part of the network.

7.11. Reverse Charging

The facility may be requested by a DTE in respect of any particular virtual call.

7.12. Reverse Charging Acceptance

This optional user facility is agreed upon at the time of applying for service. It authorizes a DCE to transmit to the DTE in question any incoming calls whose orginators have requested reverse charging for those particular calls. If this facility has not been agreed upon, such calls will not be transmitted to the DTE.

7.13. Non-standard Default Packet Sizes

This is an optional user facility agreed upon at the time of applying for service. If subscribed to, it provides for the selection of default sizes from the packet sizes supported by SAPONET, i.e. 32, 64, 128 and 256 octets of user data. In the absence of this facility, the standard default packet size of 128 octets will be used. Users are obliged to use the same default packet size for each direction of transmission, and within the same closed user group. If access is allowed to or from other closed user groups, then the default packet size of all the DTE's in the intercommunicating closed user groups must be the same. This constraint is necessary because of the end-to-end acknowledgement of data in SAPONET, which precludes the segmentation and recombination of packets.

7.14 Flow Control Parameter Negotiation

This is an optional user facility agreed upon at the time of application for service. It can be used by a DTE for virtual calls, and permits negotiation on a per call basis of the flow control parameters packet size and widow size for each direction of transmission. If a calling DTE has subscribed to the flow control negotiation facility, it may separately request packet sizes and window sizes for each direction of transmission. If a particular window size is not explicity requested in a call request packet, the network (DCE) will assume that the default window size is requested. Similarly, if a particular packet size is not explicity requested, the DCE will assume that the

default packet size is required.

SAPONET supports the facility for negotiation for the flow control parameters with two constraints: the window and packet sizes negotiated for one direction must be the same at both ends of the virtual call.

7.15. Fast Select

This an optional user facility that may be requested by the DTE in respect of a particular call. A DTE must invoke the fast select facility on a per call basis by means of an appropriate facility request in a call request packet, using any logical channel that has been assigned to virtual calls.

The fast select facility, if requested in the call request packet and if the call request packet indicates no restriction on response, allows this packet to contain a calling user data field of up to 128 octets and authorizes the DCE to transmit to the DTE a call- connected packet containing a called user data field of up to 128 octets, or a clear-indication packet containing a clear data field of up to 128 octets. If the call request packet requesting the fast select facility indicates restriction on response, it may contain a calling user data field of up to 128 octets, and authorizes the DCE to transmit to the DTE a clear indication packet containing a clear user data field of up to 128 octets; the DCE would not be authorized to transmit a call-connected packet.

The presence of the fast select facility with no restriction on response in an incoming-call packet authorizes the called DTE to issue as a direct response a call-accepted packet containing a called user data field of up to 128 octets, or a clear-request packet containing a clear user data field up to 128 octets. The presence of the fast select facility with restriction on response in an incoming-call packet authorizes the called DTE to issue as a direct response a clear-request packet containing a clear user data field of up to 128 octets; the DTE would not be authorized to return a call-accepted packet.

7.16. Fast Select Acceptance

This is an optional user facility agreed upon at the time of application of service and authorizes the DCE to transmit to the called DTE calls that request the fast select facility. If the facility is not agreed upon, the DCE will not transmit such calls.

7.17. Priority

The X25 recommendation makes provision for additional facilities at the discretion of the administration, and SAPONET offers a priority facility, which gives the calling user the option, at an increased packet-count charge, of having his packets dealt with ahead of non-priority packets in all packet queues in the

network.

8. Triple-X Service

Triple-X makes its appeal mainly to the small-volume user whose small number of terminals - perhaps only one - does not justify the provision of X25 facilities on his permises. If, however, a Triple-X user has sufficient terminals, he may supply his own Triple-X PAD at his premises under the same conditions that apply to X25 PAD's. Such a PAD is connected to an X25 port at the SAPONET DSE by a leased-line access circuit operating synchronously according to X25 protocol.

As with all other SAPONET services, Triple-X provides full-duplex facilities.

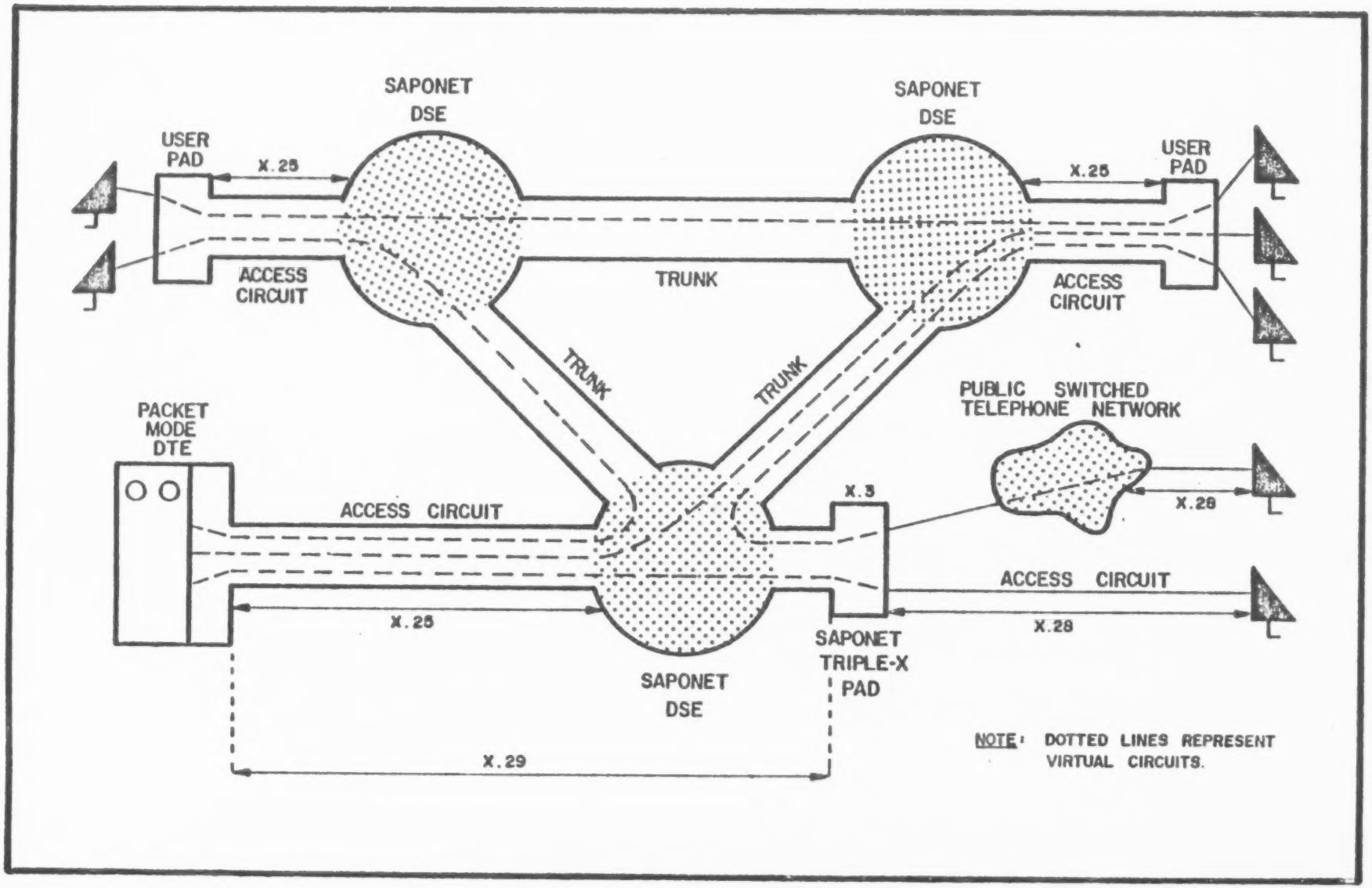
Triple-X users have the option of gaining access to common Triple-X PAD's by means of leased-line access circuits, or by dial-up via the public switched telephone network (PSTN).

A Triple-X user (having leased-line or dial-up access) may originate data calls to:

- Another Triple-X user having leased-line access, but not to one having dial-up access
- An X25 user
- Compatible users connected to public switched data networks in other countries, via SAPONET's international links.

9. Triple-X Service With Leased-Line Access

At bit-rates up to and including 300 b/s, a 2-wire access circuit with V21 modems will suffice, but a higher bit-rates up to and including 1 200 b/s, one must either have a 4-wire access circuit with V23 modems, or else a 2-wire circuit with the more expensive V22 modems. The break-even distance is 30 km, i.e. if the length of the access circuit is less than this distance, a 4-wire circuit with V23 modems is the more economical solution.


SAPONET
DSE
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CIRCUIT
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SAPONET
TRIPLE-X
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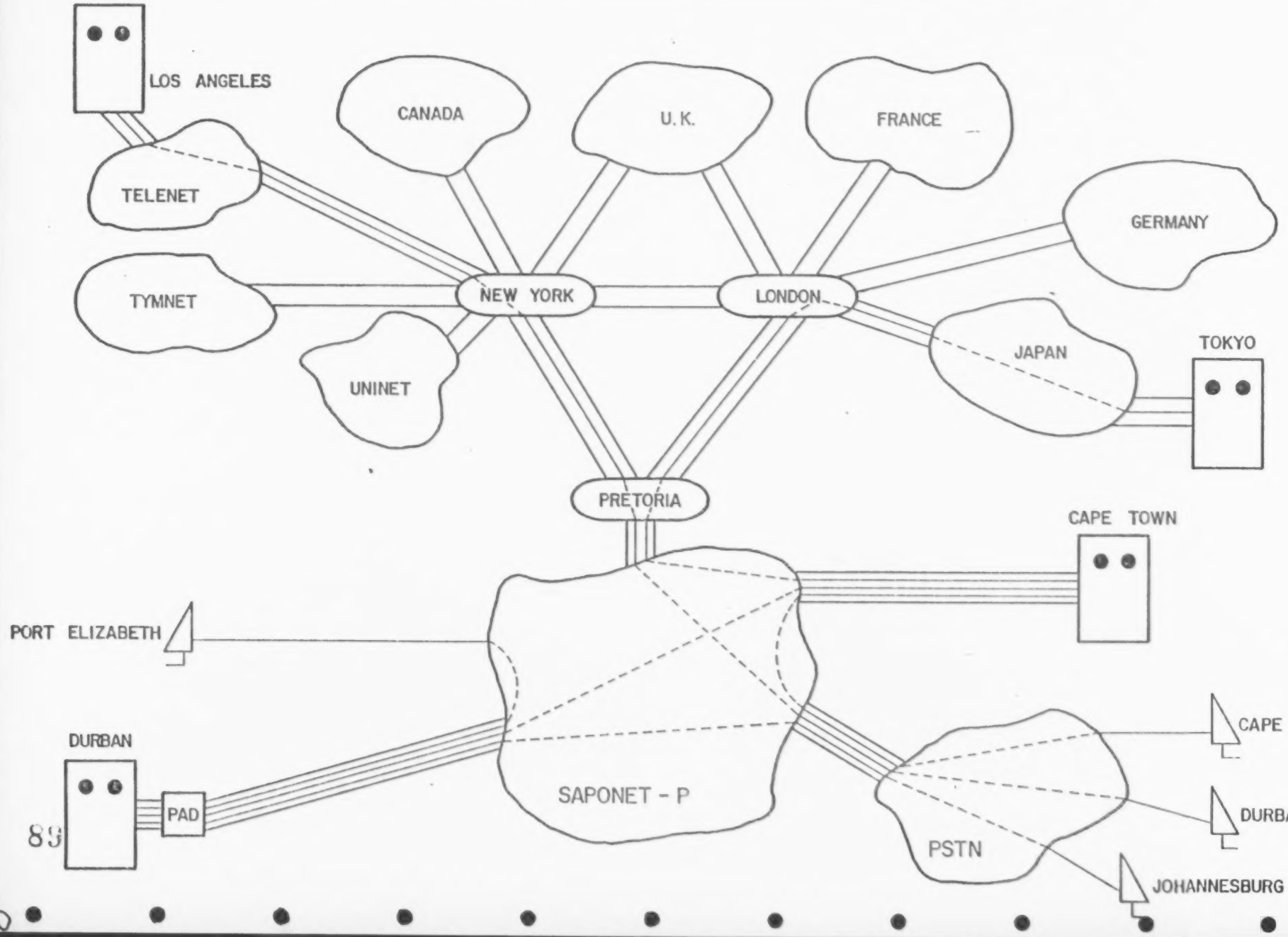
NOTE: DOTTED LINES REPRESENT
VIRTUAL CIRCUITS.

UNIVERSAL COMPUTER ACCESS THROUGH PACKET-SWITCHING



LOCAL AREA NETWORKS

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University of Cape Town

November 1985

INTRODUCTION

Why we have Local Area Networks

During the late 1970's and early 1980's there evolved a need for networks to access computers remotely. Some of the reasons were that the remote machines ran a common application, that the software needed was simply not locally available or that the local computer was not powerful enough. In many cases the need was simply to have access to a computer; any computer.

The proliferation of mini-computers and micro-computers during the last few years has led yet again to another wave of demand for interconnection. This time however the terminals or workstations to be interconnected exist within a single building or group of buildings such as a campus. In addition, access may be needed to local large host computers, as well as the outside world via a gateway to a wide area network. Moreover, workstations may use a common network to share files or databases or an expensive resource such as a laser printer.

The objective of this paper is to explain the different approaches to LAN's and to describe the important issues when planning such a network.

When is a Network a LAN

There is no single defining characteristic of a Local Area Network (LAN), although the product of capacity and length of the LAN medium in bit-meters per second is sometimes used [Ref. 3]. When this product is divided by the signal propagation velocity, the number of bits potentially in transit on the network at any one time is obtained. For a LAN this figure is typically between 10 and 100 bits on a 1 kilometer link. A conventional wide area network, for example, may have hundreds or thousands of bits in transit at any instant.

Another consideration is that the maximum distance between any two workstations in a LAN is at most a few kilometers and more likely only tens of meters. A practical limit to a LAN is often the boundary within which cables can be privately installed without resorting to common-carrier facilities.

It is moreover usually expected that a LAN should allow the attachment of several types of workstations such as synchronous terminals, personal computers, file storage devices and host computers from different vendors. Ideally this should be so, but at the current stage of the technological development, it is often the case that different vendors' software is mutually incompatible.

It is also envisaged that at some time in the future a LAN should be able to carry some or all of, coded and non coded information, data, text voice and images. Such Integrated Services Data Networks (ISDN) will however not be restricted to LAN's only. Fig. 1 illustrates what a LAN of the future may well look like.

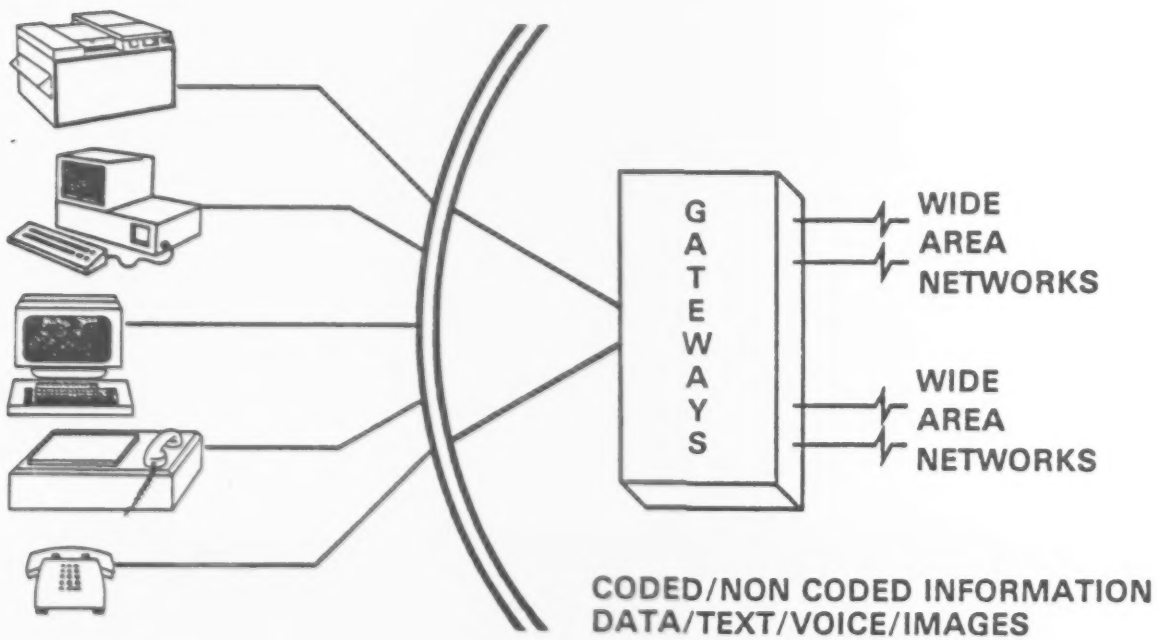

Fig. 1. A LAN - as it may appear in the future

LAN Topologies

The pattern in which the various workstations on a LAN are connected to one another is referred to as the topology of the network. There are mainly two topologies, namely a ring and a bus topology. A ring topology is illustrated in Fig. 2(a) and as the name indicates, the various workstations are connected in a closed ring and the direction of signal travel is always unidirectional by design. In the bus topology illustrated in Fig. 2(b) the ring does not close up on itself and for any station to reach any other, the signal transmission must be bidirectional. Although many manufacturers supply networks which have a logical star topology, such networks are not LAN's in the true sense of the word and are often simply a network connecting a set of personal computers.

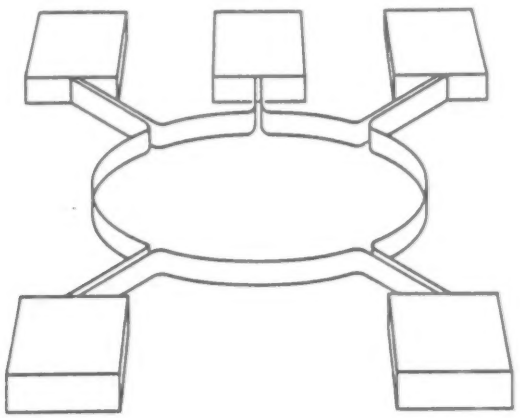

Fig. 2a. LAN Topologies: Ring

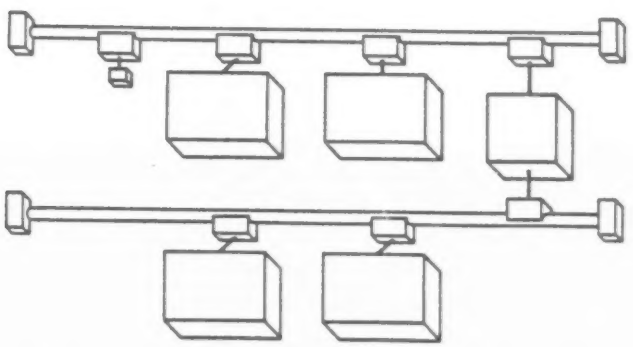

Fig. 2b. LAN Topologies: Bus

A ring or a bus can be connected to other rings or buses (as for example in Fig. 2(b)) via a **bridge**, as opposed to a **gateway**, by which is usually understood a link between the LAN and a wide area network. In the case of a bridge the protocols in the LAN being connected have to be the same. The functions of a gateway, on the other hand, are basically threefold: translating the protocols of one network to those of the next network, ensuring that the destination network does not become flooded with data as well as translating addresses between networks if required.

THE PHYSICAL INTERFACE

The Physical Medium

Transmission media suitable for local area networks include twisted-pair wires, coaxial cable and fibre-optic cables. In addition one vendor recently announced a cable designed specifically as a transmission medium for LAN's. In Fig.3 some typical cabling media are illustrated.

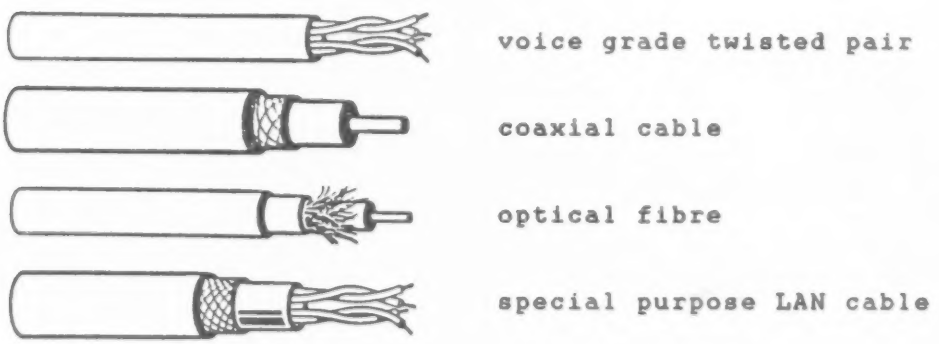

Fig. 3: Some typical cabling media

Although inexpensive and easy to install, the physical characteristics of voicegrade twisted-pair copper wires are such that practical data rates achievable are in the order of 64 Kbps or less. At the same time, the medium is very susceptible to electromagnetic interference .

Fibre-optic cable has the potential to be the superior medium for use in local area networks; it offers the very high bandwidth needed to support high data transfer rates; it is not

susceptible to electromagnetic interference nor does it generate such interference. The technology for joining fibre-optic cables and providing the physical interface between the cable and workstation has however, not yet been perfected.

The most popular LAN transmission media at the moment are baseband and broadband coaxial cable. The cable is physically similar in both implementations, but the electrical characteristics are generally different.

On a **baseband** coaxial cable a single digital signal is transmitted in one direction at a time (half-duplex mode) only. No modulation of a radio frequency carrier wave takes place as in broadband transmission, but the raw data bit stream is usually encoded before transmission, using techniques such as Machester encoding. Depending on the electrical properties of the medium, data rates as high as 16 Mbps can be achieved. Baseband cable is considered to be a "passive" medium in that all electrical power used to drive the network, is supplied by the user workstations.

Using **broadband** coaxial cable as a medium, a radio-frequency carrier wave is modulated using cable television technology to provide multiple channels if required. Broadband techniques can support data rates as high as 150 - 200 Mbps on simultaneous bi-directional transmissions (full-duplex mode). Broadband cable is considered an "active" medium, in that the electric power used to drive the network is based in the network components.

While broadband promises higher performance for the future, more baseband systems are being implemented today. One reason is cost: baseband cable is less expensive and does not require expensive modems. Nor does it require a separate power source. Future ISDN's which will require the integration of voice and video as well as coded and noncoded data, will most likely require a broadband medium however.

Media Access Methods

Since in both the ring and bus topologies all workstations make use of a common medium, protocol mechanisms are required to control which workstation may use the medium next and for how long. These protocols are usually referred to as **media access control protocols** or simply **media access methods**.

The two primary classes of media access methods are **contention** and **token-passing**. Ring networks almost exclusively use a token passing method; bus topology networks can use either.

Contention access methods are based upon the assumption that if several workstations make infrequent use of the medium, simply starting a transmission when the need arises is more efficient than implementing a complex control method. Although there are several variations, the most common contention protocol labours under the name Carrier Sense Multiple Access Collision Detection (CSMA/CD).
This latter method was developed at the Xerox Park Research Laboratories and has become synonymous with the commercially available Ethernet [Ref. 1] LAN's.

Since the latter is a baseband network which has no carrier wave the term "carrier sense" is somewhat confusing. The principle however, is for the interface controller of a workstation which is ready to transmit, to "listen" to the medium. If no transmission is taking place, it starts transmitting. The time taken for the transmission to reach a remote workstation (called the propagation delay) albeit short, is not negligible. It is therefore possible that the remote workstation may, during the time it takes for the first transmission to reach it, have listened to the medium, detected no transmission, and may thus have started its own transmission, thereby causing a collision.

As soon as both workstations realize that a collision has occurred, they immediately cease transmission and try again after some delay. There are various algorithms for deciding the length of the delay for each workstation involved in the

collision. This method, although conceptually simple, is one of the main drawbacks of the CSMA/CD access method in that no workstation can be guaranteed a response time by the network. Equally, there is no way of giving priority to any one or a group of workstations. One of the main advantages of Ethernet however, is that the interface is passive, so that a workstation may simply be switched off without affecting the rest of the network.

The most common ring access control method is the token ring protocol [Ref. 2]. Typically the "token" is a special 8-bit pattern, which continually circulates from workstation to workstation around the ring. When a workstation has something to transmit and receives the token, it turns the token into a "connector" by altering the bit pattern. Immediately after forwarding this connector, the station may start transmitting. During this time, all other workstations can only listen to the network. The process continues until the original source node receives the token from the last upstream workstation and acknowledges that the intended recipient received the message. Token passing therefore guarantees access to the network within a predetermined length of time, making it more suitable than contention methods for command control, process, or other real-time applications. It is also possible to assign a priority to a workstation or a group of workstations. If none of these requirements are important, CSMA/CD may well be the preferred technique however, particularly at low traffic rates.

Various other access control methods for ring LAN's have been developed at universities and in research laboratories. Some of these are also commercially available. Most prominent of these are slotted rings and register insertion rings. The standards world is not taking these efforts very seriously however, as will become evident in the next section.

LOGICAL LINK CONTROL

In the excitement about the, almost daily developments in LAN technology it is frequently forgotten that many vendors offer little more than the hardware and the software to achieve

the media access control. Beyond the media access control it is still necessary to ensure that a data frame, as a package of data with its accompanying control information is called, arrives error free at its destination. If the message comprises several frames, as it typically may when a large file is being transferred, there has to be a guarantee that the frames will arrive at there destination in the same sequence as when they were dispatched. In addition, it is necessary to ensure that one workstation, such as a terminal, is not flooded by data from another, faster workstation, such as a file server.

Simultaneously, it is important that frames and their content will make logical sense from one LAN to the next, or within a network, between one device and another which may not be from the same vendor. To this latter end, the Institute for Electronic and Electrical Engineers (IEEE) in the United States have proposed the following standard Local Network Logical Link Control (LNLLC)
frame:

access control	dest. addr. 8-56 bits	source addr. 8-56 bits	dest. service addr. 8 bits	source service addr. 8 bits	control 8 bits	information variable length	FCS 16-32 bits

Fig. 4. IEEE LAN Frame Format

Another issue relates to the fact whether a session is established or not between two communicating workstations before data are exchanged. A session is similar to a telephone call, establishing a permanent logical link between two workstations. The source and destination addresses are therefore only required at the time the session is set up and do not have to be otherwise included in the frame, thus saving bandwidth. This is often referred to as a connection network service as opposed to a connectionless service when no such virtual link is set up between two communicating workstations. The IEEE Frame Format clearly allows only for connectionless service. There is still some discussion in research circles as to the advantages of the one type of service above the other.

The IEEE and the European Computer Manufacturers Association (ECMA) have also laid down standards for the various access control methods referred to above. These are commonly known as the IEEE 802 LAN standards and comprise of the standards described in Fig. 5.

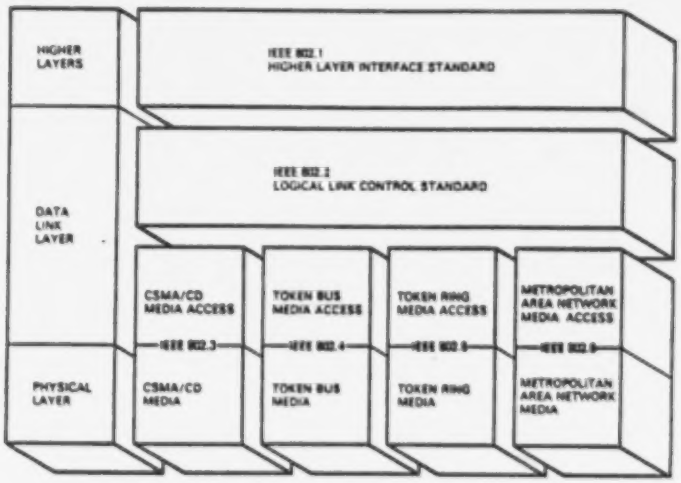

Fig. 5. The IEEE LAN standards.

Proposal 802.6 concerns itself with so-called Metropolitan Area Networks which will make use of existing physical networks used for cable television. The equivalent ECMA standards are described in Fig. 6.

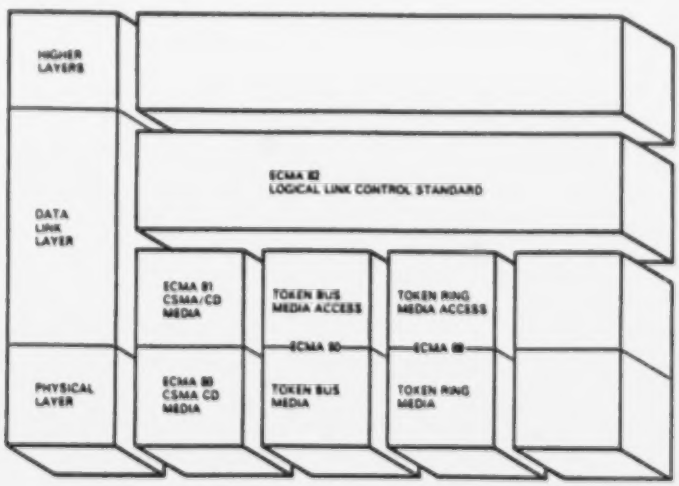

Fig. 6. The ECMA LAN standards.

The services and functions which exist at this level, including network management functions, have been referred to as the Establishment Communication System.

THE ESTABLISHMENT INFORMATION SYSTEM

Having said the above, it is important to realize that although it is important for the end user to be aware of those aspects of LAN's, it is mostly irrelevant as far as he is concerned. Being provided with a LAN with the facilities described so far, is similar to being provided with a computer and its operating system without any application software. Much more relevant to the user of a LAN are the much more loosely defined services that a LAN should provide. The collection of such services has been variously referred to as an Electronic Office System or Establishment Information System (EIS). Fig. 7 illustrates where, what is commonly understood to be a LAN, fits into the full picture.

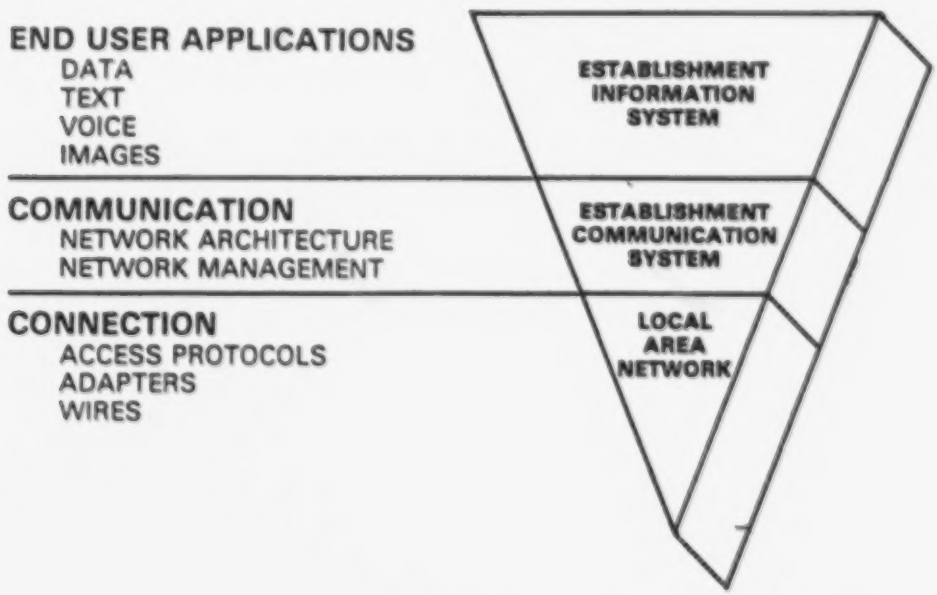

Fig. 7. Local Area Networks in perspective.

Typical EIS Services

From the viewpoint of its users, a LAN in a general office environment is therefore a collection of some or all of the following services:

Document creation. This includes preparing correspondence, reports, proposals and manuscripts. This activity may include assembling a document from other documents which already exist. The ability to substantially revise existing documents without having to retype the entire contents, improves the productivity of office workers engaged in that activity.

Document formatting. The user has normally a lot of control over how a document is formatted; that is, how the text is arranged on its pages. For example, the user can specify, independently of the contents, a document's page size and margin areas. The user can specify and respecify the document format without altering the text.

Printing documents. Because documents can be typed and revised using display devices, the user needs to print the document only after being assured that its contents and format are satisfactory. The need for successive printed draft copies is greatly reduced. The office system can usually print the document while it performs other office functions.

Document distribution. Documents can be distributed electronically through office system networks instead of through the mail.

Filing and retrieving documents. Documents can be filed electronically in, and quickly retrieved from a central library or database. The library may be remote from the site at which the document was created or where it is to be used.

It should be borne in mind that these services may be required not only on the LAN, but indeed from a remote wide area network or a remote LAN. The complexity of the problem at the EIS level

is several orders higher than at the other levels. For example, the database on the LAN may have a file format different from that of the workstation accessing it, while simultaneous updates by various users must be prevented. Very few vendors supply the software to provide services such as those referred to above and an organisation often lands up with only the bottom triangle in Fig. 7 when it acquires a "LAN".

Documentation Format and Interchange Standards

Office systems may differ in several ways, for each offers different capabilities and addresses the needs of different users. Clearly there is a requirement for a uniform structure for information that is interchanged between users of the services provided by a EIS. This structure must have an encoding method that is designed to convey any document, regardless of its contents, from one workstation on a network to another workstation on the same or a different network; and to communicate the intent of the person who sends or creates a document as to how it is to be processed.

The encoding method must also be flexible and extendible to allow it to accommodate new requirements as they arise. Rules must also be established to cause the various office systems to interpret documents uniformly and process them in a consistent manner.

Standards such as those referred to in the last paragraph are being established. One manufacturer has met the challenge with the definition of the Document Content Architecture (DCA) and Document Interchange Architecture (DIA) standard [Ref. 4].

CONCLUSION

Physically a LAN is a combination of interconnected equipment and programs used for moving data between points where it may be generated, processed stored and used. As far as the user is concerned, a LAN is a collection of services. Few vendors as yet provide the software to support those services and when they

do, a user who leaves the confines of his own LAN finds himself in a protocol jungle which will take many years yet to sort out.

ACKNOWLEDGEMENT

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BIBLIOGRAPHY

1. Metcalfe RM and Boggs DR, "Ethernet: Distributed Packet Switching for Local Computer Networks," **Commun. ACM**, Vol. 19, pp. 395-404, July 1976.

2. Strole NC, "A local communications network based on interconnected token-access rings: A tutorial", **IBM Journal of Research and Development**, Vol. 27, pp. 481-496, September 1983.

3. Tanenbaum AS, Computer Networks, Prentice Hall Inc., 1982.

4. "Office Information Architectures: Concepts." IBM Form GC23-0765-0, March 1983.

CHOOSING A COMPUTERIZED SYSTEM : LECTURE NOTES

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Notes used for lecture presented at the
Workshop on Computer Applications in
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26 - 27 November 1985

INTRODUCTION

As more and more hardware and software is made available it becomes a difficult and complex task to decide what hardware and what software is the most suitable for a particular library. Some suggestions are given in this lecture as to how one can set about evaluating the various options available.

SPECIFY REQUIREMENTS

The first step which should be taken when a decision has been made to consider introducing computerized procedures into a library is to specify in some detail what will be required of the proposed computerized system. Such a description of requirements is essential because it provides a point of reference from which it is possible to assess whether or not computerization will be of benefit and whether or not the available hardware and software will be able to meet the requirements. Included in the specification should be a statement of the constraints which apply to the proposed system. The constraints indicate the boundaries or limits within which the system or its development must be considered. Constraints may for example result from a limitation on the funds which can be made available for the purchase of a system or on the type of computer equipment which may be used.

The specification of requirements is dealt with in more detail in a separate lecture presented at the Workshop.

DETERMINE EVALUATION CRITERIA

Once the requirements and constraints have been specified the criteria to be used for evaluating the available hardware and software and the relative importance of the criteria must be decided on. The criteria used should reflect the particular requirements and constraints of the library for which computerization is being considered so taking into account the library's particular circumstances. Evaluation criteria used may therefore differ from one library to another.

The following are examples of some general types of criteria which are used:

a) The capabilities of the systems being evaluated in relation to the requirements to be met by the system. Factors to consider when evaluating according to this criterion are for example the extent to which

* the required functions can be carried out
* the processing workloads can be handled
* the anticipated growth in the processing workloads can be provided for
* required standards can be met e.g. standards such as SAMARC for bibliographic records.

b) The reliability of the hardware and software being evaluated. Information which can be of use in assessing reliability are

* the number of people or organizations who have already purchased or rented the hardware and software
* reports on the hardware and software from present users
* the length of time for which the hardware and software have been available on the market
* the extent to which the hardware and software are still being supported and maintained by their developers or manufacturers.

c) The reliability and stability of the suppliers of the hardware and software. Factors to take into account when assessing the suppliers are

* the length of time that they have been in business
* their financial standing
* the number of people which they employ
* the ability and experience of their employees.

d) The maintenance and support available from the suppliers. This criterion relates to the two preceding criteria. No hardware or software is entirely fault free and, in addition, computerized systems tend to evolve and change over time. One would therefore wish to have some degree of assurance that the hardware and software supplier can provide some maintenance and support for the products which it supplies. Factors to take into account here include for example

* the number and quality of support and maintenance staff employed by the supplier

* the type of support and maintenance contracts which the supplier is willing to enter into

* the documentation on the hardware and software which the supplier has at his disposal.

e) The expandability and flexibility of the systems being evaluated. Because of the changing nature of the capabilities required of a computerized library system and because of the continual advances being made with regard to hardware, it will generally be important that the system can be readily adapted and enhanced in order to accommodate such changes. Factors to take into account include

* for software the provision which is made for additional functions to be added to the system, the capabilities for linking to other systems, and the ability for the software to be transferred from smaller to larger more sophisticated hardware configurations

* for hardware the extent to which the hardware can be upgraded e.g. to increase the disk storage capacity, or provide faster printing facilities, or for a greater number of terminals to be linked into the computer.

f) The cost. Cost is an evaluation criterion which will invariably have to be included. Care should be taken to ensure that all cost elements are included when assessing costs. Cost elements would for example include

* software and hardware costs
* maintenance costs
* telecommunications costs.

When the evaluation criteria have been finalized they must be assigned weights which indicate their relative importance. In a particular library, for example, it may be decided that the maintenance and support available from the supplier is of great importance because the library itself has no staff available to it who could be capable of maintaining the system. The relative value of the criteria could be indicated, for example, by assigning a total value of 100 points to each of the criteria. Take as an example an evaluation in which 6 criteria were decided on. These criteria could be weighed as follows:

Criteria	Weight
A	25
B	20
C	15
D	5
E	25
F	10
	100

This shows that criteria A and E are equally important and are the most important and that the order of importance of the remaining criteria is criterion B then C, F and D, with D being the least important.

For general criteria such as those just listed (capabilities, reliability, etc.) it is possible to break each one down into more specific or subcriteria such as those described. For example, factors such as the length of time that a supplier has been in business are subcriteria which can be used for evaluating the stability of the suppliers. Weights can also be assigned to each set of subcriteria as a means of indicating their relative importance within the set.

GATHER THE INFORMATION NEEDED IN EVALUATION

In order to carry out the evaluation, information relating to the evaluation criteria which have been decided on must be gathered for each of the candidate systems.

Visits to other organizations (libraries, computing centres, etc) using systems which are the same or similar to those being evaluated can yield useful information. Such visits will provide information on the practical experience of others and so help in obtaining a realistic picture of the merits or otherwise of the candidate systems. Visits to suppliers of the systems' hardware and software will also yield useful information, particularly as the reliability and stability of the suppliers is often one of the more important criteria for evaluation. Other needed information for use in the evaluation may have to be gathered by literature studies and by studies of the library's existing systems.

CARRY OUT THE EVALUATION

Once sufficient information on each of the candidate systems has been obtained, the evaluation can be carried out. This can be done by assigning scores to each system for each of the criteria. For example a score between the values 0 to 10 or the values 0 to 100 can be assigned to each criterion according to the merits of the system being evaluated.

The higher the score, the better the system with regard to that particular criterion. Once scores have been assigned, these should be multiplied by the weight for the criterion. The resulting figure for each criterion must then be added up for each system. The system with the highest score will be the most suitable for use by the library. The following is an example of the scoring in an evaluation:

Criterion	Weight	Score for Candidate 1	Total for Candidate 1	Score for Candidate 2	Total for Candidate 2
A	25	2	50	7	175
B	20	8	160	8	160
C	15	3	45	3	45
D	5	9	45	4	20
E	25	5	125	2	50
F	10	3	30	3	30
			455		480

Of the two candidates in the example the second has the higher total score (480) and is therefore preferable.

SUMMARY

The steps to be taken in evaluating alternative computerized systems for use in a library have been described here as being

* specification of the requirements to be met by the system
* determination of the criteria to be used in evaluation
* gathering of information relating to the criteria for each candidate system
* rating of each system against each criterion
* identifying the preferred system by calculating rating scores for each candidate.

These steps provide a systematic and reasonably objective method of evaluation.

Evaluating and selecting a computerized library system is a difficult task and the examples given in these notes present only an overall and simplified picture of what is involved in carrying out such an evaluation. An actual evaluation particularly for a large system is much more complex and can take some months to complete.

FURTHER READING

ARMSTRONG, C.J. Micro-automation - the problems of selection. The Electronic Library, vol. 2 no. 3, July 1984, p. 165-174.

BOSS, R.W. The library manager's guide to automation, 2nd edition. White Plains, N.Y. : Knowledge Industry Publications, c1984.

HAYES, R.M. and BECKER, J. Handbook of data processing for library. 2nd edition. Los Angeles, Calif. : Mellville, c1974.

TEDD, L.A. An introduction to computer-based library systems. 2nd edition. Chichester : Wiley, 1984.

November 1985

REQUIREMENTS SPECIFICATIONS FOR LIBRARY SYSTEMS : LECTURE NOTES

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Notes used for lecture presented at the
Workshop on Computer Applications in
Information Systems, Cape Town
26 - 27 November 1985

INTRODUCTION

The preparation of specifications forms an important component in the overall process of introducing computerized procedures into a library. This lecture concentrates on the preparation of a requirements specification and is a summary of articles published elsewhere (see refs 3 and 4).

A requirements specification for a library system contains a concise description in some written form of what the prospective users of the system, i.e. library staff and library users or clientele, require of the proposed system. In other words it describes what the system must do or achieve. In the specification the proposed system is described from the librarian's point-of-view rather than from the system designer's or programmer's point-of-view. It must therefore describe the system in terms understandable to library staff and should ideally be compiled by library staff.

A properly prepared requirements specification forms an essential component in the process of developing and evaluating computerized library systems because:

1) it describes the system in such a way that it can be understood by librarians, designers and programmers alike; it therefore facilitates communication

2) it provides a foundation on which the development or evaluation of a system can be based

3) it serves as a project management tool as it provides a point of reference from which progress made in developing the system can be monitored and from which the system as it is developed or implemented can be evaluated.

Unfortunately the importance of requirements specification is often overlooked so that specifications when they are prepared are incomplete and ambiguous and cannot be used for the three purposes described above. The intention in this lecture is to create an awareness of the importance of this type of specification and to provide some guidelines as to its preparation. Attention will be paid to the content of a requirements specification and to methods and procedures which can be used in its preparation.

REQUIREMENTS SPECIFICATION AND THE SYSTEMS DEVELOPMENT PROCESS

Before these aspects are described it would be as well to put the process of requirements specification into the context of the overall systems development or evaluation process.

Requirements specification logically takes place early in the systems development process because it forms the basis for the later phases in systems development.

Requirements specification is preceded by an initial phase in which the problem or need which is to be addressed by the proposed system is defined (e.g. long queues at the issue desk; specialized information retrieval services).

In the requirements specification phase what requirements are to be met are specified.

This phase is followed by what could be called the design phase and in which how the requirements are to be met is specified. Where a software package, or ready-made system is used the development phase may not be necessary or may involve only the adaptation or enhancement of the package to tailor it to the needs of the individual library.

In the further phases of systems development the system is developed or "constructed", installed, and maintained.

The requirements specification phase can be described in more detail in terms of three sub-phases, these being:

1. the gathering of information about requirements
2. the structuring of the information on requirements
3. the representation of the information on requirements.

In sub-phase 1 as much information as possible which pertains to the requirements to be met by the proposed system is obtained. At this stage, however, the information is not organized in any way. This is done in the second sub-phase where the information which has been gathered is studied and interpreted, and supplemented where necessary. In the third sub-phase the information which has been gathered and structured is represented in such a way that it can be communicated in a clear, concise and unambiquous way to all of those people (librarians, designers, programmers, etc.) who have some concern in the development or implementation of the system. The end-result of this third sub-phase is therefore the requirements specification represented in some recorded form.

Three tasks are therefore involved in the preparation of a requirements specification, namely

* information gathering
* information structuring
* information representation.

Methods and procedures must therefore be found which are suitable for carrying out these tasks. First though it is necessary to describe the types of information which should be included in a requirements specification.

THE CONTENT OF A REQUIREMENTS SPECIFICATION

The following are the types of information on requirements which should be specified:

a) The objectives of the system which is to be computerized. The objectives stated here are the objectives of the system as a whole and not the objectives of introducing computerized procedures. A statement of the objective of a library's lending system could for example be "to issue on loan to approved library users documents in the library's collection or documents obtained on loan from other libraries in such a way that maximum availability of documents to users is achieved with the minimum expenditure of time, money or effort by the library's personnel and its users."

b) A statement of the constraints or restrictions imposed on the system or on the development or evaluation of a system. Types of constraint which may apply are

   * the scope of the system under consideration e.g. computerization only of the library's lending system is to be investigated and not of any of the library's other systems such as its acquisition systems

   * the funds and staff available for development or purchase of a system

   * the computer facilities which are to be used by the system or which may be considered e.g. a constraint may be imposed limiting the computer hardware which may be considered to certain makes

   * the time which may be spent in developing or evaluating systems.

   The constraints imposed must be known before the evaluation of hardware and software is started because they define the boundaries within which the evaluation must take place. There is no point for example in evaluating large mini-computer based systems if the funds available are insufficient to pay for such systems.

c) The functions to be performed by the system i.e. the actions or operations to be performed. Besides describing the functions in some detail a description should also be given of such aspects as:

   * estimated frequency with which functions are to be performed and the expected growth in frequency in future

   * the geographic location in the library or elsewhere at which the functions are to be performed

   * the logic to be applied when the functions are to be performed (e.g. the logic to be applied when determining whether or not overdue notices are to be sent to users who have books on loan)

   * the sequence in which the functions are to be performed.

d) The data-carrying output the system will be required to produce. The data-carrying output includes such things as the printouts to be produced by the system e.g. catalogues, overdue loan reminders, purchase orders to book suppliers. Information on the output which should be specified includes

* the purpose for which the output product is needed
* the content of the output product i.e. the data elements which it should contain
* the number of copies or duplicates required
* the estimated number of records in the output and the anticipated growth in the number of records
* the physical location within the library or elsewhere at which the output products must be kept and must be accessible.

e) Sources of data which are to be used. Details should be given here of any data-carrying input which is to be used as a source of data and which originates outside the system being specified. An example is MARC (Machine Readable Catalogue) records supplied by a national cataloguing agency. The same type of information for these input sources should be given as is given for the data-carrying output.

f) The data elements needed in the system. Examples of data elements are the names and addresses of library users and of book titles, and the author, title, place of publication and other bibliographic information used in describing publications. The data elements described in detail here would be the data elements which are to occur in the data-carrying output and in the sources of data.

METHODS SUITABLE FOR USE IN COMPILING A REQUIREMENTS SPECIFICATION

As noted earlier, three tasks are involved in requirements specification:

* information gathering
* information structuring, and
* information representation.

1. Information gathering methods

Information gathering takes place in many spheres of activity, for example in systems analysis work. Methods of information gathering are therefore in general use and relatively simple and straightforward to apply. They need therefore not be described here in any detail.

Applicable information gathering methods are interviews, group discussions, questionnaire surveys, direct observations and sampling. The study of documents relevant to the system being investigated can also yield valuable information e.g. statistics on the library's activities.

2. Information structuring methods

Information structuring results in the organization and coordination of the information on requirements. It is needed particularly with regard to the information on the system which must be specified in some detail, that is to the data and the functions of the system.

Applicable information structuring methods are functional decomposition, data flow analysis, and data structure analysis.

2.1 Functional decomposition

The functional decomposition method recommended results in the top-down, general-to-specific, breakdown of the functions - so forming an hierarchy of functions. The function of acquiring documents can for example be broken down into the sub-functions of verifying acquisition requests, ordering the documents, paying for documents; each of these sub-functions can be further broken down into more detailed functions. This example is illustrated in Figure 1.

2.2 Data flow analysis

Data flow analysis involves the study of the flow of data through a system, from the data source to its ultimate destination or output. In studying the data flows the functions to be performed are also identified.

An example of data flow analysis for the acquisitions function of a library would show, for example, that requests from users for documents to be obtained would be subjected to a verification activity which requires the input of such data as the funds available for purchase of documents, and existing library holdings so that unnecessary duplication is avoided.

Data flow analysis can be used to determine what groups of data elements are needed in a library system and with which functions these data elements are associated. Data flow analysis includes the use of functional decomposition and therefore also provides needed details of the functions required in a system.

2.3 Data structure analysis

By data structure analysis is meant the breakdown of the groups of data elements as found in records or in data flows, according to the relationships which exist between the data elements. It concerns the inherent relationships and characteristics of the data and not the physical structure of the data; the physical structure of the data is more the concern of the system designers and programmers.

In data structure analysis certain characteristics of the data elements which appear in a record (or a data flow) are used to break down the groups of data elements in the record into logical subgroups. For example, the analysis of the data elements which are to appear in a library's order to a

supplier for a document would result in the grouping of those data elements which relate to the supplier (such as supplier name and address), the grouping of those data elements which relate to the document being ordered (data elements providing the bibliographic description), and the grouping of those data elements which relate to the library ordering the document (such as the library's name and address).

The following features of data structures can be identified:

* mandatory and optional occurrence of data elements (i.e. an element must or may be present in a data structure), e.g. a data structure for bibliographic records may require that a title must appear in the record and that a series title may appear but need not necessarily appear in all such records

* alternate occurrence (i.e. only the one or other of two or more data elements may occur in a given data structure), e.g. either an ISBN or an ISSN may appear in a bibliographic record

* repeated occurrence, e.g. the author data element may be repeated in a bibliographic record as more than one author may have been responsible for writing a book or article

* sequence of occurrence (i.e. the sequence in which data elements are to appear in a data structure), e.g. the sequence in which parallel titles for a publication are recorded in the bibliographic record may have to follow a set pattern to ensure that the correct bibliographic information is associated with each of the parallel titles.

3. Methods of representing information

Once the needed information on requirements has been gathered and structured, it must be represented or recorded in some form. Suitable methods are needed for the representation of all the types of information to be contained in a specification.

Some of the information will of course best be recorded in textual form using a natural language such as English. An example is the information on objectives and much of that on constraints.

3.1 Data dictionaries

Some control should be kept of the terminology used to avoid confusion as to the meaning of terms used and the use of synonyms. A data dictionary is a suitable means for controlling terminology. Included in such a dictionary can be a list of the data elements required in the system together with definitions of the data elements and other relevant information such as the average length of the data element. An example of a data dictionary entry is given in Figure 2.

3.2 Data flow diagrams

Data flow diagrams are another suitable method of representation. They are used in conjunction with data flow analysis and can be used to represent a number of aspects of a system, in particular the data flows and the functions. An example of a data flow diagram is given in Figure 3.

3.3 The representation of data structures

Data structures can be represented in primarily a textual form listing all data elements found in a particular record and at the same time by the layout used indicating the hierarchical relationships between the elements.

PROCEDURES FOR USE IN REQUIREMENTS SPECIFICATION

The procedures described here represent a series of steps which it is recommended should be followed in order to ensure that the process of requirements specification is carried out satisfactorily. These steps are applicable to much of the overall process of systems development or evaluation and not only to the requirements specification phase of the process.

The following four procedures are recommended:

1) Establish a project team or systems developer group.

   This team may comprise one or several people, depending on the extent of the system envisaged and the size of the library. This team is responsible for compiling the requirements specification.

2) Establish an advisory group.

   The purpose of the advisory group is to assess the work of the project team and to provide advice on requirements. Ideally all major groups of people who will be affected by the computerized system envisaged should be represented in this advisory group. These should include library users/clientele, library management, management staff responsible for the computing facilities likely to be used by the system, and of course library staff.

3) Carry out the steps involved in determining requirements in a set sequence.

   The sequence to be followed is:

   * determine objectives and constraints
   * determine, at the general level, what requirements are to be met
   * specify details of data carrying output, sources of data, and data elements
   * specify functions of the system in detail.

4) Provide for the review of the requirements specification as it is compiled.

   As sections of the specification are completed they should be reviewed by project team members for completeness, accuracy and comprehensibility.

SUMMARY

In these notes the contents of a requirements specification have been briefly described as well as methods and procedures suitable for libraries to use in gathering, structuring and representing the information on requirements. A requirements specification prepared in this way should prove of great value when computerization of a library system is being considered.

RECOMMENDED READING

1) FITZGERALD, J., Fitzgerald, A.F. & Stallings, W.D. Fundamentals of systems analysis. 2nd edition. New York : Wiley, 1981.

2) GANE, C.P. & Sarson, T. Structured systems analysis : tools and techniques. Englewood Cliffs, N.J. : Prentice-Hall, 1979.

3) LODDER, N.M. Methods for use in the preparation of requirements specifications for computerized library systems. In : Proceedings of the International Conference on the Application of Mini- and Micro-Computers in Information, Documentation and Libraries, Tel Aviv, Israel, March 1983, edited by C. Keren and L. Perlmutter. Amsterdam : North-Holland, 1983, p. 531 - 550.

4) LODDER, N.M. Procedures for use in compiling requirements specifications for computerized library systems. Mousaion, series 3, vol. 2 no. 2, 1984, p. 3 - 32.

5) WEINBERG, V. Structured analysis. New York : Yourdon Press, 1979.

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EXAMPLE OF FUNCTIONAL DECOMPOSITION

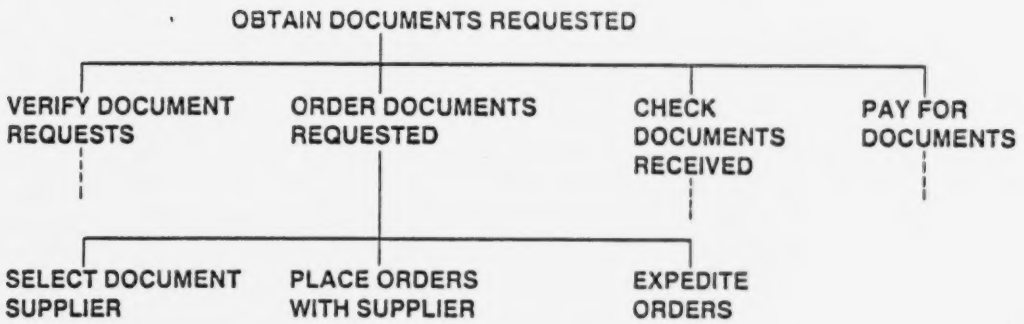


FIGURE 1

EXAMPLE OF DATA DICTIONARY ENTRY

name	PERSONAL-AUTHOR
description	The person chiefly responsible for the creation of the intellectual or artistic content of a work (AACR2 chapter 22).
aliases	NONE
length	VARIABLE; AVERAGE 13; EST MAX 38; EST MIN 2
related data elements	CORPORATE-AUTHOR
note	AUTHOR is not a data element; the term AUTHOR is a collective term used to refer to both the PERSONAL-AUTHOR and the CORPORATE-AUTHOR data elements.

FIGURE 2

EXAMPLE OF DATA FLOW DIAGRAM

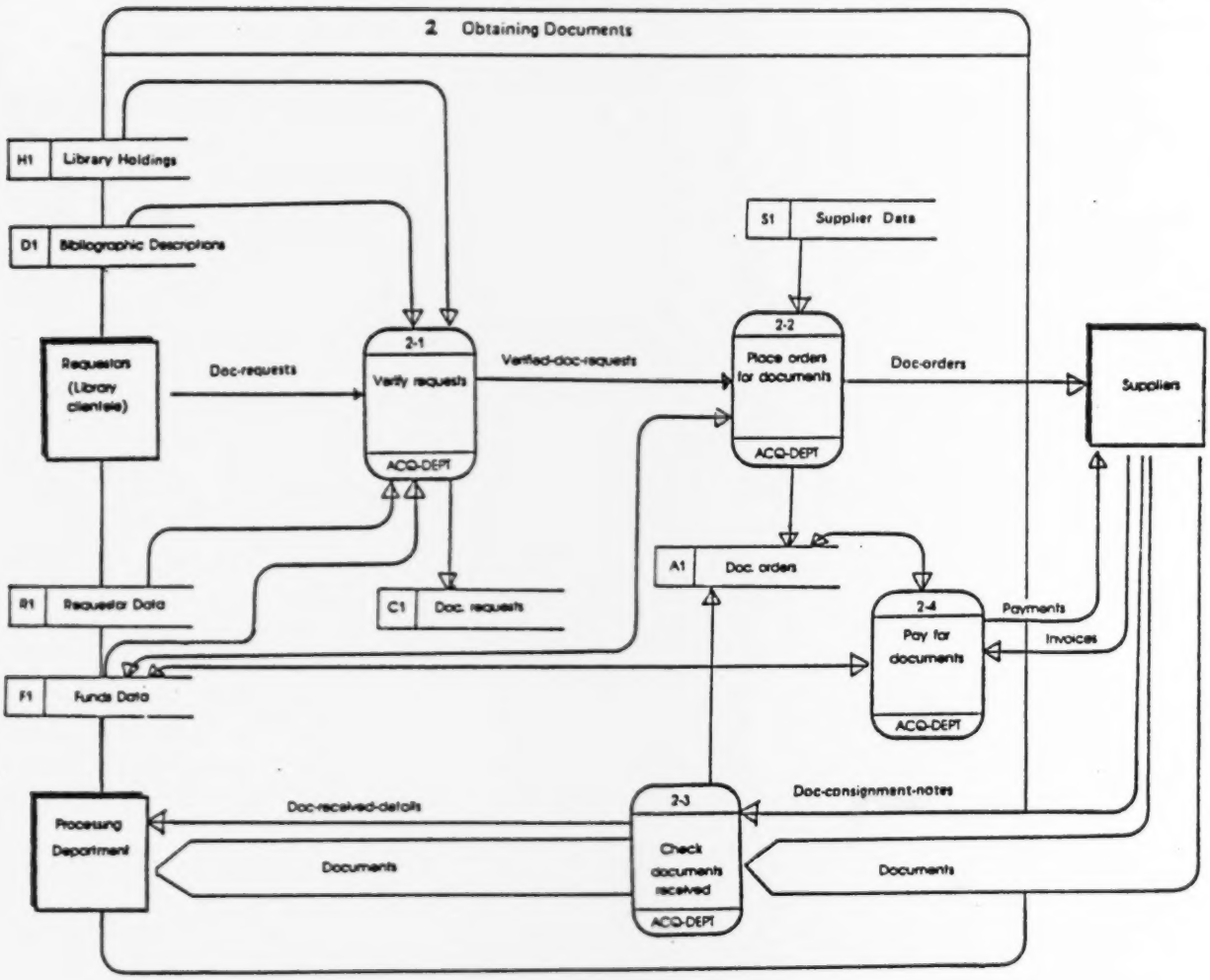


FIGURE 3

IMPLEMENTATION OF A COMPUTERIZED SYSTEM

Kerry Stephenson

All library computerisation projects involve three major factors: the library management and staff, the data processing management and staff, and the vendor organization. Their relationships and the degree of involvement of each will depend to a large extent on the size of the venture, and the degree of completeness of the package sold by the vendor.

Completeness

Most library projects consist of implementing a package. The package may be complete, even to the extent of including the hardware, or it may comprise only some basic software around which the application must be developed. Generally the degree of "completeness" will decide the extent to which the librarian will employ the talents of the vendor (for more complete packages) or the in- house data-processer (DP-er) (for development work).

In turnkey packages the inhouse DP staff may have practically nothing to do with the project at all, while when developing a system from the ground up the vendor may have very little to do with the library application. Neither extreme is desirable. The librarian should, as far as possible, use these two sources of expertise as checks on one another, and on the whole project. At least there should be an agreement on the basic feasibility and cost of all major system proposals.

The vendor should approve inhouse development in as much details as possible. System planning, file structure, programming and software strategies should be approved for a totally new system. Changes to a library package, especially to file structures, should be vendor-approved.

An early role for inhouse DP staff is to evaluate the proposed system benefits as they are spec1t out to management in initial proposals. Inhouse DP-ers should be explicitly asked to warn in advance of possible limitations, for example response time, memory, communications or expertise availability.

In both cases too, the librarian must manage his degree of dependence on a single source of expertise. Both these sources and to some extent the library staff, are vulnerable to staff changes and other exigencies which will divert expertise from your library project. The more customizing that has been done, the more vulnerable you are.

Size

Apart from the parent organization's general policy regarding control of DP projects, the size of the project is a major factor determing the degree of involvement and control of various parties, such as the library, DP centre and other system users. If the system is going to use a very small proportion of the DP centre's resources, the library can expect to have fairly complete control over the project, and should make sure it gets it. If the proposed system is fairly large, DP-ers and other interested parties are going to be more seriously affected. At some stage they will be competing with the library for the organization's DP resources.

The project must therefore, from the start, and all the way through, have sufficient clout, both technical and political, to hold its own. This is to some extent achieved by getting proposals signed off by the vendor, DP-er and those allocating money to the project. It must be followed up by

fulfilling those proposals, based on sound planning and good implementation. A project that is running on schedule and within budget is far less likely to be axed than one that is not delivering.

However, no library is likely to be allowed untrammelled day-to-day control over a DP project, where it is using anything over 5 or 10 per cent of the organization's DP resources.

Summary

The library initiates the project, obtains funding, and must take all major decisions. But it will have to share its control depending on its degree of dependence on centralized DP or the vendor.

Project Organization

A project is by definition a temporary effort by a group of people usually drawn from different parts of an organization. Library computerization projects typically comprise a shifting set of people:initially Oranisation and Methods (O&M), then the library, DP and members drawn from various parts of the library as those parts are involved.

Project leader

There should be one person who is at the centre of all the information flow and decision-making during the life of the project. Usually this person will continue after implementation as system manager. A high proportion of his/her time will be spent on the project up to system sign-off. On a multi-module system a high proportion of this person's time may still be involved after sign-off. The project leader should be a person above the level of the affected departments, that is a person at department head or deputy librarian level. This may seem a high price to pay but the alternative is to refer many decisions up to that level anyway, because computerization increases the interdependence of departments and forces decisions upwards by its very nature.

It is possible to use a more junior person (in a planning type role) in the early phases of the project, but the time spent in briefing seniors will increase sharply as the project progresses. The person selected must be capable of functioning at that level.

Other qualities to look for are a feel for or experience of computers, knowledge of technical processing, enthusiasm, and the ability to communicate, roughly in ascending order of importance. A further vital component is a personality that is tolerant of ambiguity, that seeks compromise and progress rather than strict adherence to the rules, who is results-orientated rather than a perfectionist. While one wants these qualities in a project leader, they must be counterbalanced, probably by others in the project, by the capacity for painstaking work, attention to detail and high standards of quality. It is a give and take situation.

Computerization Committee

Committees can be used (or abused) in a variety of configurations. Factors such as the scale of the project, the culture of the organization, the degree of autonomy of the library, and the existing interdepartmental liaison structure will determine what is appropriate for a project. Typically there is a project committee within the library, and on larger projects, a steering committee.

The steering committee should have just the requisite variety and seniority of representatives to ensure that it will steer the project not only through calm seas but also through storms, through external attacks, insurrections and faction fighting. Its major task is to maintain a favourable political and financial environment within the parent organization for the project.

Within the library a group of two to four persons should form the kernel of a team that from time to time includes O&M, DP, and various departments within the library. Very often libraries have much larger "working" Committees, usually with the aim of "involving" all affected departments and so allaying their fear of computerization. Their fear is usually much over-rated, better combated in more efficient ways, and quickly overcome by successful implementation.

The life of a project

The following chart (taken from Corbin, p. 23) illustrates the major phases in the life of a simple project, and also a commonly used method of charting them.

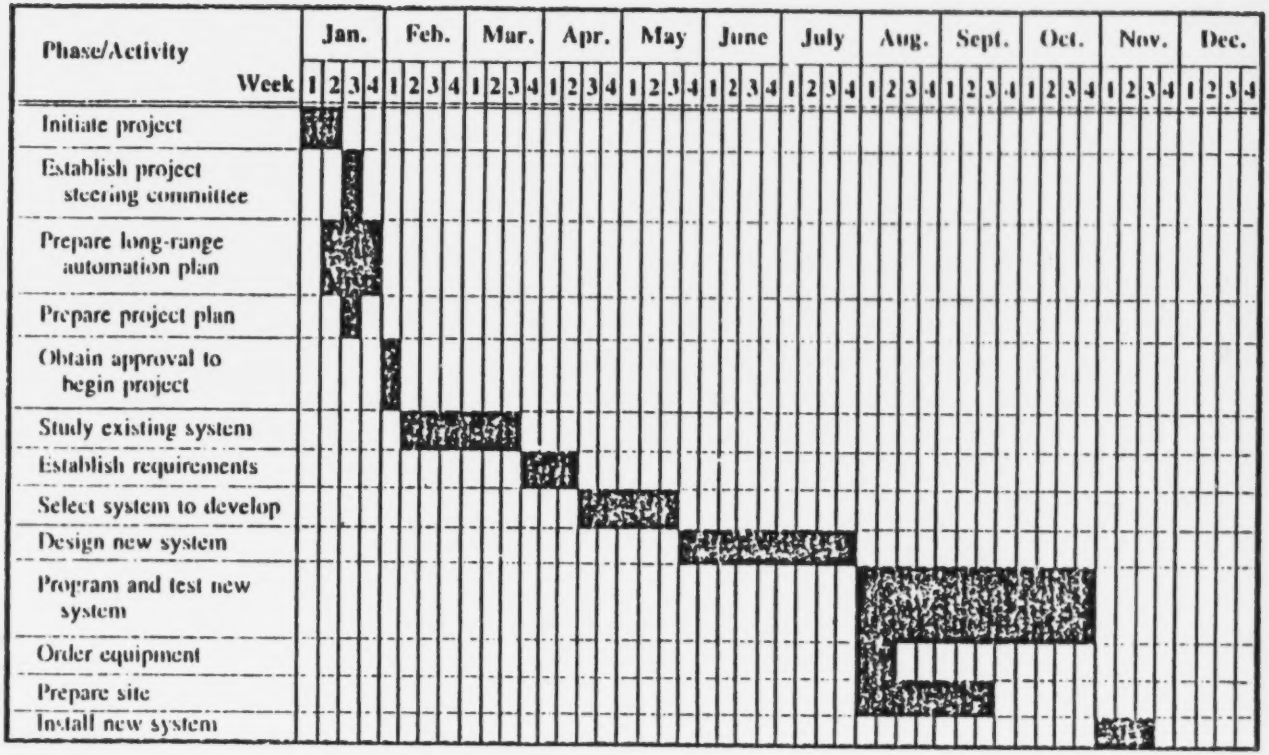
Here a basic system was chosen and adapted for the library. It appears to be a small scale project, an extensions of the organization's computer (very likely a mainframe) to part of the library. It is somewhat dated in these days of special-purpose library software, integrated packages and dedicated distributed computers.

More typical today would be a long budgeting process at the outset, more emphasis on selection and evaluation of a system, and on coordination inside and outside the library, and less emphasis on design, programming and testing. Training and implementation would receive more time, and would be phased over a period.

A schedule for a major project would therefore look more like this, presented now as completed tasks rather than as activities:

1. Steering and working committees established.
2. Initial capital estimates approved.
3. Project leader post approved.
4. Initial feasibility study completed.
5. Agreement to project objectives by all concerned.
6. Revised capital estimates approved.
7. Preliminary survey of available systems and detailed study of existing procedures complete and signed off by all concerned.
8. Technical requirements specification complete and signed off by all concerned.
9. Retrospective conversion philosophy agreed to in principle.
10. Implementation plan agreed in principle.
11. Evaluation method and criteria agreed by all concerned.
12. Contractual guarantees and service requirements agreed.
13. Tenders invited.
14. Review of evaluation criteria in the light of hitherto unknown possibilities proposed by vendors.
15. Short-list agreed to.
16. Detailed technical evaluation completed.
17. Initial financial and contractual evaluation completed.

A GANTT CHART USED AS A PROJECT SCHEDULE

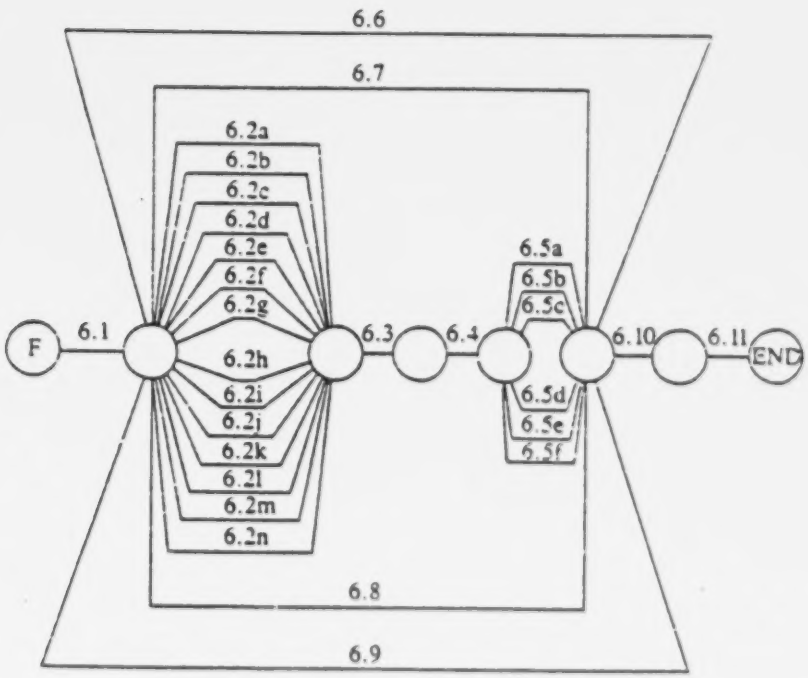


18. Further information, guarantees and adjustments sought from area provided by proposers.
19. Final selection
20 Detailed implementation plan signed off by all concerned.
21. Phased implementation begun and signed off in stages.

Project planning and internal control

The list above illustrates the use of mutually agreed dates for the completi on of mutually specified tasks. Becase, as mentioned, a project is by definition a non-routine, one-off effort, very little can be assumed to happen routinely. A great deal of planning, of thinking about what will be needed, how it is to be done, by whom, and when, must be done. For example the implementation of the project can broken down into the following activities: (from Corbin, p. 119-120).

6. SYSTEM IMPLEMENTATION



1. Review and, if necessary, revise the plan for project completion

2. Develop site preparation specifications
   a obtain hardware installation specifications
   b select a site for the in-house computer, if one is to be installed
   c prepare space layout charts for the in-house computer room

d prepare space layout for other space required by the system
e prepare electrical power specifications
f prepare temperature specifications
g prepare humidity specifications
h prepare wall, partition, and ceiling specifications
i prepare floor specifications
j prepare storage facility specifications
k prepare lighting specifications
l prepare cabling specifications
m prepare safety and fire specifications
n prepare security specifications

3. Prepare the site

4. Prepare job descriptions

5. Orient and train the staff
   a develop user documentation
   b plan the orientation and training program
   c conduct general orientation sessions
   d train staff to operate the equipment
   e train staff to operate the system
   f conduct follow-up orientation and training

6. Orient library patrons

7. Acquire special supplies, equipment forms

8. Create essential machine-readable files

9. Install and check out the hardware and software

10. Activate the new system

11. Evaluate and accept the new system

This basic analysis of the work to be done then has to be translated into man-hours, and assigned to a specific person with dates for start and completion. A Gantt chart is good for this. Only once the thinking, specifying and estimating has been done does one sit down with the parties concerned and negotiate the final terms. Of course the terms are never completely final. Not everything can be foreseen. Circumstances will change. The project will not run according to plan. The task of the project leader is to create the right climate, where milestones or objectives are realistically set and seen to be achievable, as well as being considered to be worth a lot of effort to achieve, and yet are re-negotiable.

Internal control of the project is based on the same planning, but with interim milestones. Control over individuals working within the project should be based on milestones about two weeks apart. Work must be divided into manageable chunks. If the chunks are too large, there is insufficient sense of progress; if too small, there is no sense of personal achievement. Obviously this will vary with individuals. Relative beginners should be given smaller tasks, and challenged with larger ones as their confidence and ability grows. However, if the tasks are allowed to grow too large, there is too great a danger of discovering a mistaken direction after much effort has been expended.

An individual's milestones must be agreed to by the person concerned. Nearly all the work that is being done will be new and there will be no standard or predetermined amount of work that can be achieved in a day or in two weeks. The same principle of careful estimating and negotiating targets must therefore be followed. The more such negotiating can be done in a team atmosphere rather than in private, the greater the commitment, but this may be at the expense of accurate. Wishful thinking and realism must be balanced against one another. A team spirit of commitment is, however, a very powerful motivator, and should be encouraged as much as possible.

Fortnightly assignment of tasks is no way to keep in touch with what is going on. The project leader must be in daily contact with all project members, especially those with less structured tasks or less experience.

Communication

A project assembles the various talents and specialities required to get the job done. The fact that project members' efforts are being pre-planned, co-ordinated and dove-tailed by a planned schedule of tasks is invariable insufficient to achieve close co-ordination and understanding of how each element fits in with all the others. A myriad of unresolved issues will arise, each requiring a decision. Very often the correct decision can quickly be taken after consultation with another person, or after time-consuming individual investigation. The channels for the flow of such information must be kept open, without the whole project degenerating into a welter of committees, discussions and deferred decisions.

The project leader plays a key role here. He should quickly pick up the sign that somebody is in difficulty, has a tricky decision to take, or has done something which may affect another part of the project. He can immediately bring together the right people to assist, or supply the guidance himself. Above all, an atmosphere of free and open discussion of problems should be created. It was pointed out earlier that DP-ers are inclined to be problem-solving loners. This can be very time-wasting, and a balance must be struck. Similarly, in large libraries, there are always areas of the library's operation that are not well-known to another librarian, and the team leader should have sufficient knowledge of all areas to recognize when a decision may affect another department, and to bring in the necessary expertise. Internal communication can be greatly enhanced by housing the team in one area, especially an open plan area. This is often not possible, however. What will not work is to hold daily or weekly problem-solving and discussion meetings. Problems do not occur immediately prior to a meeting; each problem will affect only two or three people, and the rest will feel that they are wasting their time; the time pressure will lead to hasty and conflict-based decisions; together, these will lead to the witholding of information and more problems.

Fairly routine problem-solving meetings can work, however, where all the members are involved intimately in every problem, and where the presentation of problems is highly structured. All staff can benefit greatly from the "walk-through". This serves not only to solve current problems, but also to teach novices how to analyse and solve a problem, and to keep members in touch with developments in other areas of the project than that on which they are working. This frequently illuminates their own problems, and also develops back-up staff.

The only purpose which justifies bringing together a large multi-disciplinary group routinely is for very short (twenty to thirty minutes) progress report meetings. These may be necessary when the project is under great pressure, for example when implementing computerization in several inter-dependent departments simultaneously.

Project documentation

Even a small project will generate a large amount of paper. It is not proposed to deal here with routine documentation either on the software or the library side, but only that which is of particular importance in library computerization projects.

Specifications

We have indicated that libraries, and especially ther records and files, are complex structures. When giving this complex structure over to the problem-solving DP-er, it is imperative to go into considerable detail to ensure that the problem is correctly stated and understood. The specifications will be detailed, lengthy, and very time-consuming to prepare, but they must be explicit and unambiguous.

Manuals

When the project team hands the solution back to the library, with it go detailed manuals on how to operate the new systems. These should include the operating manuals for the cataloguers, desk staff, acquisitions staff, and so on, as well as manuals for the system operating staff.

The latter manuals will not make a great deal of sense to the average librarian, but the librarian is the only person who really cares whether the system is being properly run. There must therefore be a section or introduction or a separate manual which is written specifically for the librarian, indicating what output to expect, what procedures are to be routinely run, what the reporting line is for problems for various kinds, and other information of this nature. One of the key points to be covered here is how the librarians controls whether back-up procedures are being followed routinely.

Progress documentation

The solving of the problem generates its own special documentation. Much of the work is of course recorded in amendments to the specifications, and its final product is recorded in the manuals. What remains to be recorded is the progress from start to finish. This can easily be overdone, with voluminous formal plans, charts and progress reports. The touchstone of sanity is provided by producing only that documentation that is necessary to guide the actions and decisions of the people involved.

People closely involved in the project work from specifications and under the close direction of the project leader. In addition they need an indication of how their work contributes to the project as a whole. People peripherally involved in the project and top management must also be kept informed. As these people are busy with many other things besides the project, such reports and proposals should be concise, and only produced as required.

The major reports to be submitted to the library's top management are:

- The overall project schedule
- Reports of the study of the existing system
- The requirements for a new system
- The evaluation of alternatives with a recommendation for the best and most economical system
- An implementation report outlining staffing requirements, staff orientation and training and the special supplies and equipment which must be purchased
- Routine (monthly) reports on the progress of the project.

Within the project team, progress recording is the other half of task planning and setting milestones. Overall planning sets out the schedule for completion of major phases, and integrates the various work-streams. Wtihin each phase the tasks are created, allocated and scheduled. The report-back on milestones achieved gives and immediate indication of slippage. Slippage is very easy to sweep under one's mental carpet. It is therefore good practice to have the project leader report all slippage to an independent reviewer, so that the implications can be fully examined and plans properly reviewed.

The Evaluation Process

The purposes of evaluation

An evaluation exercise services three main purposes:

- To select the system most suited to the requirements
- To identify specific gaps in the selected system
- To contractually establish the capabilities of the system

There are also ancillary benefits such as learning a lot about library systems' potential, their weaknesses and good features, finding out new approaches to a problem, and so on.

There is some conflict between the three purposes listed. The last two go well together, but together are not too comfortable with the first. These last two tasks must be very detailed exercises, focussing on the design features and capacities of the proposed hardware, software and services. They are also very time-consuming if done properly (and by their very nature they must be done properly to be effective at all). To go through the process with all candidates is very lengthy.

Most importantly, though, the first process is only in part a technical evaluation. The technical prowess of a system must be considered along with aspects such as the financial and commercial strength of the company, risk exposure, potential for innovation, compatability with existing systems and expertise, supplier credentials and so on. Further more, the whole lot has to be projected five years into the future, along with the relevant political, demographic, technological and business trends.

Shortlisting

In some cases all this will be more important than in others, but in most situations it should be possible to narrow the field of candidates on the basis of broad strategic assessments. One would be left with those few systems (between one and three), that warrant detailed evaluation. It is then more likely that a thorough job will be done, and that adequate attention to the last two functions will also be given.

The shortlisting process is compatible with conventional "open tender" procedures. One can build conditions into either the tender requirements or the evaluation criteria which will exclude unsuitable tenders.

One is still left in a relationship that makes both comparison and negotiation very difficult. The suppliers have legally committed themselves to a particular configuration and price structure. It may not be possible to incorporate new technology, different pricing or another configuration which will actually suit both supplier and library far better. Also, the competitiveness of the tender situation is not always conducive to a realistic mutual appraisal of one another's true requirements and capabilities. Nobody has got themselves a good deal when it is discovered six months later that the tenderer has promised far more than he can deliver, or that the library has underestimated its requirements on one area.

The negotiated contract

An alternative to the tender is the negotiated contract, which forces both parties to be more realistic about what they are letting themselves in for. There is no (illusory) safety net to fall back on, that the deal was made "in fairand open tender", with eyes wide open. There is exactly the same safety net of contractually established mutual obligations. The negotiated contract allows the parties to pay more attention to the quality of the balancing act than to the safety net.

The open tender is a relic of an age of mass-production and hard engineering certainties. Many libraries cannot escape it, so they should recognize its inadequacies and ensure that they counter them. The key is to sign the final contract only after having given ample opportunities for mutual exchange of information. For example, while the tender invitation may stipulate a certain configuration and specific contractual terms, tenders' alternatives should be invited. The stages of the selection process can be formally incorporated and announced in the evaluation process. The tender should stipulate that the final configuration may differ from that tendered - as it invariably will.

Certain crucial aspects, notably conversion or capture of data, and the timing of a phased installation, can only be finalized after mutual investigation and negotiation. In the classic tender situation these are on,y decided after tho contract has (to all intents and purposes) been awarded, at a fixed price. It is almost certain that verbal promises, undertakings and plans will have been made by that stage. Once the contract is signed, one party drops into the "open tender" safety net, and leaves the other alone on the wire...

Advisors

The library must recognize that the few weeks in which the selection, evaluation and negotiation take place are the culmination of many man-months, even years, of work, during which enormous amounts of cumulated expertise must come into play from both sides, and enormous amounts of information must be exchanged.

It is a sheer waste of effort to put all this energy simply into the task of selecting a tender. It is essential to leave plenty of time for detailed negotiations with one, or a few, suppliers. This is the time

when all the library's advisors, including the DP. legal and financial departments, can make their most valuable contributions. Their contributions should not be limited to passing or failing a proposal. They should have the opportunity to discuss the merits and demerits, to seek out weaknesses and strengths, to create new possibilities, in conjunction with the library and the supplier.

Seek the best fit

Many people, especially in the public service, shy away from such a situation. They feel they are "putting the squeeze" on the suppliers. They are uncertain, even mistrustful, of commercial motives. If approached in that way, the negotiations will probably not be very successful. The library has to accept that a competitive and profit-making situation exists.

Building the future

The choice of an integrated computer system is fairly immutable, perhaps for a decade. Yet, judging by the great emphasis found in most published guides on choosing a system based on the present, proven capabilities of a system, one would think that either the library is not expected to change in the next decade, or that the system is expected to last only a year. This may be relic of the early days when one bought the basics and made adaptations as one went along. It may result in the installation of a system which lacks this year's facilities, let alone those of five years' hence.

Because buying a system is a long-term commitment, the evaluation process should result the fact that essentially the library is establishing a 10-year relationship with a supplier, rather than just buying a parcel to be delivered in three months' time. Of the writers in ths field, Boss gives the best attention to this fact. Beyond the typical American wariness about suppliers' financial credentials, he raises issues such as the degree or commitment of the supplier to the library market, even to a particular sector of the library market, in terms of capital invested, specialist staff employed, other sources of income, and so on. This is certainly not only a large and often overlooked aspect of selection, but should colour the entire evaluation and negotiation process. It is a time when a long-term partnership is established.

REFERENCES

Boss, R.W. A manager's guide to library automation. 2nd ed. KIP. 1984

Corbin, J. Developing computer based library systems. Onyx Press, 1981

Keen, J.S. Managing systems development. Wiley, 1981

Reeves, J. Selecting and installing an online stand-alone circulation system. VINE 56, December 1984.

STRATEGY FOR DEVELOPMENT : A PERSONAL ACCOUNT

by MARLENE SACHS
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INTRODUCTION

I want to thank the organizers for the privilege of participating in this workshop. We have been given a rich fund of valuable knowledge in the excellent papers and demonstrations presented here.

In the audience are many familiar faces of colleagues who have, without exception given me the benefit of their experience and expertise. I thank you all very much.

My paper is a case study in a commercial situation where time is money and cost-effectiveness is the by-word. The paper will be as practical as possible. We are all in the information business - and very business-like we are too, but the concept of an informaton manager has long been understood as this gracious description by de Montaigne (16th century) illustrates :
"Her business (information) is not to find a man's eyes, but to guide, govern and direct his steps, provided he has found feet and straight legs to go upon"

Here is a summary of the main aspects of my paper

MANDATE/ORIGIN OF PROJECT :

Establish MOBIL'S Information Needs within a possible Library/Information Records Centre

OBJECTIVES

Which departments have a requirement for a library;
What information should be stored in the library;
The form in which it should be stored;
The type of access required;
The volume of information to be stored;
The size of the library;
Procedures for storing and retrieving documents.

COMPANY BACKGROUND

MOBIL OIL SA (MOSA)'s parent company is Mobil Oil Corporation, ranked by Fortune 500 as the third largest industrial corporation in the USA and one of the largest multinational companies in the world. MOSA employs plus minus 3000 people in SA of which 640 are at Cape Town Office. The project arose as a result of requirements for the new building currently being constructed in Cape Town for MOSA head office. I am not employed permanently by MOBIL, but am undertaking this project on a consultancy basis.

- The departments are highly autonomous and do their own thing;
- There is no central library;
- There is no central acquisitions policy;

- No record at all of any published material so I had to collect these facts before I could even begin the project.
- By the year 1990 there will be a terminal at everyone's workstation which has obvious implications for an information system.

STRATEGY

There are three overall approaches to determining specific information systems i.e. top-down, bottom-up and evolutionary development. The top-down method involves analysis from the general to the most specific and was most suited to my mandate : had to establish whether there was a need for a library before I could establish intricate details.

Identify user needs for each department

- type of information retrieval system in operation
- number and types of material involved
  - formal/informal
- present and future information needs
- number of staff and structuring
- analysis of workflow within each department
- inputs, throughputs and outputs in each situation

Analysis of workflow between departments and individuals

- requirements
- elimination of duplication within the user community

Compilation of location catalogue
Who's got What, Where and How Many

Visits to other special libraries

Compilation and analysis of departmental information needs questionnaire

- which departments have a requirement for a library
- present needs
- future needs
- library/Information and Records Centre functions

It is absolutely essential to identify user needs as systems are established in the first instance in response to a particular user need.

ACTIVITIES

1. Obtained organizational charts to get some idea of the company. FAMILIARIZATION with the organisation through Initial Scoping Interviews. Each department nominated a departmental representative who would liase between me and the rest of the department. The interviews were informal discussions to obtain an overview of departmental workflow, information needs, etc.

2. LOCATION CATALOGUE ACTIVITIES

   - defined material categories to be recorded
     - monographs/books
     - serials/periodicals

- conference proceedings
- reports
- standards and specifications
- MOBIL publications - everything published by MOBIL for example, manuals, reports, price lists

correspondence was excluded

- designed forms for individual categories
- typing and printing of forms
- compiled manual with examples to assist in data capture
- visited heads of departments to explain project
- explained data capture procedures to personnel nominated by heads of department - a crash course in AACR2!
- created acronyms, department location codes and material code files; this would greatly facilitate transfer of information to any software package bought in the future
- formatted fields for data capture
- modified and tested fields
- redesigned forms/manual to correspond to fields
- manual
- correcting forms - ongoing
- continually assisting in data capture - ongoing
- updating catalogue - ongoing

The catalogue is online using SAS

It will;

- list MOBIL holdings
- show what information should be stored in the library
- identify the type of access required
- avoid duplication
- indicate the volume of information to be stored;
- indicate the size of the library
- help to identify procedures for storing and retrieving documents

The project was begun in July 1985
To give you an idea of the size of the project :

- Number of personnel visited and instructed - 60
- Number of departmental collections recorded- 38
- UCT librarianship students assisted for week of 09-130985

3. DEPARTMENTAL INFORMATION NEED ANALYSIS QUESTIONNAIRE (DINAQ)

- detailed structured quantifiable questionnaire
  The responses which are coded will be fed onto the computer and sorted into verifiable facts and figures - very important in a business organization
- designing and structuring DINAQ
- testing and modifying questionnaire
- formatting fields for DINAQ
- modifying SAS fields for DINAQ
- interviews with key personnel - time was of essence, so limited personnel to managerial level only - their responses would carry authority

OBSERVATIONS & CONCLUSIONS

1 CONCEPT OF LIBRARY/LIBRARIANS

There is a generalized stereotype of a librarian :
bun and glasses, ready to bite a book buttered with margerine!
Ignorance in management and applies to general public at large as to t is what is involved in librarianship and therefore one could be given unrealistic project deadlines. It is a first essential to re-educate management, eliminate the stereotype idea of a librarian stamping books and emphasize and show that we are professionals in the information fields.
Therefore have chosen the term INFORMATION RECORDS CENTRE instead of library

2 COST EFFECTIVENESS

This is a commercial environment; therefore the information records centre has to be seen as paying its way. A common argument found in a number of firms is : "We have never had a library so why must we have one now"

3 GLOBAL VIEW OF INFORMATION

- within the organisation
- nationally : networks
- internationally : data bases, cost of materials in the present poor economic climate - need to pool our resources, streamline existing systems

UNIFORM KEYWORDING & INDEXING RETRIEVAL SYSTEM

My personal conviction that I pursue with messianic zeal is the necessity of a uniform keywording system applied to all the different media eg. from correspondence to videos . And to construct a set of standardised procedures, in order to ensure a uniform Indexing Retrieval System for the entire organization.

It would :

- avoid duplication therefore be more cost effective
- enable quick and easy information retrieval
- be user friendly
- allow quick and easy assimilation of new staff
- facilitate easy staff movement between departments
- eliminate reliance on people's memories
  i.e. in which drawer in which cabinet document A is filed

5 CENTRALIZED CONTROL

It did not take me long to realize that centralized control and recording of information was essential because of the numerous entry points into the organization. The final location of the material did not matter so long as it was indexed and could be retrieved through a location catalogue.

6 COMPUTER TECHNOLOGY

I was assigned to the computer department, my supervisor being the User Services Manager. This indicated that management recognized the essential link between the information officer and computers.

- one cannot operate without the other; will become increasingly so in the future
- and librarians will have to have sound knowledge in the field

7 MULTI-DISCIPLINARY SERVICE

Unlike other more specific special libraries e.g. law, engineering etc.. this organization requires a wide subject coverage and a multi-disciplinary service in fields ranging over management, retail, marketing, technical/scientific, finance and accounting, manpower.

8 DOCUMENTATION

- Essential to document your procedures, approaches, methodology and dealings with management. Any system that you initiate could eventually form the basis of a library manual

- Issue monthly progress reports especially if they have never had a librarian before. You are an unknown quantity, therefore keep management informed as to what you are doing and why

9 PROFESSIONAL CONTACT

This is absolutely vital when one is working alone. The exchange of ideas, support and brainstorming obtained through visits to special libraries, informal discussions and academic colleagues cannot be underestimated.

Frequently a "challenging job" is merely a euphemism for a lot of hard, unappreciated, backbreaking work with little adequate reward. This project, however was challenging in the true sense and I feel privileged to have had the opportunity to be part of the new wave in information science.

COMPUTER APPLICATIONS IN INFORMATION SYSTEMS - CLOSING COMMENTS

J G SMITH

1. INTRODUCTION

The workshop provided an excellent forum to introduce and explicate the many applications of information technology to library and other information systems. It highlighted the rapid evolution in information technology and the resulting impact on the management of information systems and the services offered.

The importance of computers and related technologies in information work was recognized and emphasized by all contributers. However, a caveat was generally issued that computers should not be seen as the solution to all problems. Information systems are social systems with persons at their nucleus and the satisfaction of user needs constituting their main objective. Computers can only at best enhance the efficiency of such systems, or as Professor Kesting suggested during his words of welcome, only augment the rational faculties of man.

The workshop organisers succeeded very well in involving all participants by integrating formal papers with demonstrations and a final case study which forced total participation. This evoked a lively debate concerning the many relevant issues and provided an effective culmination and conclusion to the two days' deliberations.

Ms Myburgh delivered the introductory paper providing the background material on the development and application of information technology as well as introducing the main concepts involved in the use of computers in information systems. She, furthermore, provided a framework or rationale for the general proceedings of the workshop. She suggested that the integration between new developments and applications in computer and telecommunications technology and their effect on information management should constitute the main theme of the workshop.

The introduction of information technology has had a major influence within three main areas in the information field, viz: to supplement traditional information sources, to facilitate information processing and organization and, lastly, to improve access to external information sources. In all three areas new developments in information technology, such as, 5th generation computers, artificial intelligence and expert systems will have a marked impact on the information environment and open new frontiers in future. Library information systems in South Africa, generally speaking, are keeping pace with new developments and it is noticeable that here, as elsehwere in the world, there is a trend towards the implementation of commercially supplied integrated systems rather than the inhouse development of stand-alone systems.

The topics addressed during the workshop can be categorised into five broad areas, viz:

(a) Access to external sources of information

(b) Processing of inhouse information

(c) Database construction/creation

(d) Telecommunications and networking

(e) Management and organisation of the computerisation process

The case study provided a final convergence of all the topics.

2. ACCESS TO EXTERNAL SOURCES OF INFORMATION

The two papers by Dr Rossouw and Mrs Van Niekerk investigated the various configurations and services from which data or information can be tapped from remote centres on an external basis. Dr Rossouw concentrated on the various facilities offered on the international market, while Mrs Van Niekerk explicated the facilities of SABINET, our local shared cataloguing network.

Dr Rossouw covered a divergent range of facilities, from the traditional bibliographic sources of information, to access to full-text databases and the application of electronic mail services as

an adjunct to online searching of databases. He explored the possibilities of videotext and the 'host computer' providing a gateway or linking facility from the system you are locked into to a wide range of other services.

It is envisaged that in future SABINET will expand its present functions to incorporate advanced technology to accommodate an expanded membership outside the traditional library sector. It could become a data pool incorporating a variety of discrete databases for various sectors such as Libraries, Publishers, Museums, and Indexing Agencies. Mrs Van Niekerk suggested that a highly sophisticated, flexible and efficient search facility will be developed which might be expanded to provide local and international gateway facilities.

Both speakers emphasized that future development will concentrate on the evolvement of user-friendly end-user systems designed to by-pass intermediaries and facilitate the use of the systems by untrained users. Advanced technological innovation would be employed to enhance the user/system interface and to move away from technology driven systems to systems that concentrate on user satisfaction. In both situations there will be a move towards expanded markets outside the confines of library and information services.

Dr Rossouw stressed the advantages of expanding ones services to access remote data sources, but also issued a warning that before embarking on such a venture the accompanying technical and financial constraints should be carefully considered and evaluated. He drew specific attention to vendor contracts; equipment, telecommunications and training requirements and costs; changing policies and database royalties.

Mrs Van Niekerk, furthermore, stressed the point that the positive/negative effect of SABINET on libraries is largely dependent on the library's local resources and constraints, but most important would be the attitude of the staff towards the new innovation. It is imperative that proper planning and systems analysis preceded the introduction of SABINET, or any facility providing online access to remote data bases.

3. PROCESSING OF INHOUSE INFORMATION

In contrast to discussing access to external sources, a group of papers and demonstrations concentrated on various aspects of the inhouse processing of library orientated data. They ranged from an emphasis on an integrated multi-function system approach, to a discussion of a few stand alone single function systems, to a discussion of the features of support and applications software packages currently available on the market.

Miss Lodder stated that the current discernable trend is for larger libraries to adopt an online integrated multi-function approach utilizing mainframe or minicomputers. In such instances it is imperative to develope a sound central bibliographic data base to act as the core of the system and to which all functions and library activities can be related.

Smaller, special libraries and information centres, however, have tended to utilize microcomputers and concentrated on information retrieval functions and various other individual functions rather than on an integrated approach. They have developed sophisticated micro-retrieval facilities, while the larger systems have emphasized a macro-retrieval approach. Much developmental work, however, still needs to be done as at the present moment very few systems exist that cater adequately for all library and information centre requirements with the same level of sophistication.

In a later paper, Miss Lodder outlined the various categories of support and applications software required in a library situation and the features of a number of packages available. These ranged from packages installing online integrated systems to various individual stand alone systems.

All packages should be carefully evaluated, the producers' credentials checked, and an assessment made of the suitability of the package in terms of the library's real needs. Care should be taken not to underestimate the needs of the library and the computing facilities required. On the surface a microcomputer system might initially appear satisfactory and cost effective, but from a long term point of view a mini/mainframe configuration might be far more

cost effective and realistic.[132]

The URICA turnkey system was demonstrated as a prototype of an online integrated library system. As it is a turnkey system, the software as well as the hardware is supplied by the vendor. A variety of configurations that are available were explicated to the audience.

Mr Van Zwam outlined the main features, advantages and disadvantages of the Checkmate serials control software package. This was a good example of a single function system, as serials control persists in presenting problems in any library situation whether computerised, or not. It is, however, clearly intended for a system with limited stock employing microcomputer facilities.

EBSCONET is a large worldwide online serial titles system providing access to order, cancellation, budget and various other query functions. If a library was locked into the EBSCO subscription service it could provide valuable information.

Various other stand alone microcomputer software packages, such as INMAGIC, were demonstrated in a separate location. Delegates were able to gain hands-on experience in using such packages.

4. DATABASE CONSTRUCTION

The two papers by Ms Blomkamp and Mr Van Wyk addressed the problems and various aspects of database construction. Ms Blomkamp outlined the rationale for creating an inhouse database and how to undertake the task. Various design criteria relating to material selection, indexing policies and the relevant database structure were proposed. She emphasized the importance of fully involving the user community throughout the design and construction process. The ultimate aim is to structure and create a user friendly and transparant database.

Mr Van Wyk looked specifically at the relationship between information retrieval capabilities and database structure. He concluded that to optimise the retrieval function, specific care should be given to indexing policies in relation to database creation as the

indexing process plays an important role in retrieval effectiveness. He warned against transposing manual indexing practices with their inherent constraints to the computerised situation.

Indexing policies should be adjusted to incorporate new features and capabilities of computerised databases to improve the retrieval possibilities of the system. By combining the enhanced features of computerised databases and interactive searching, we can evolve a new indexing philosophy with improved output capabilities. Specific reference was made to the possibility of the greater utilisation of the post-coordinate approach and natural language index terms.

5. TELECOMMUNICATIONS AND NETWORKING

With the growing trend towards interdependence amongst nations and societies it is natural that libraries and information centres should follow this trend towards greater connectedness, specifically within a computerised environment. Ms Myburgh suggests in her paper that this move towards inter-library connectedness has been facilitated by a tendency to converge developments in computer and telecommunication networking.

Networking provides the facility, not only to move the library out to remote databases, but also for the user to access inhouse library databases from outside the library's walls. Such developments could only enhance the library/user interface.

Societal changes are all working towards emphasizing the necessity to share resources and to improve inter- and intra-society cooperation. With this in view Ms Myburgh suggested that diminishing economic resources, rising costs, improved networking technology, changing demography and an increasing realisation of the value of information in decision making and education, should provide a growing impetus to adopt a networking approach amongst library and information systems.

She stressed, furthermore, that information technology innovation and standardisation could only lead to improved networking facilities in future. This could ultimately result in an Integrated Services Data Network providing a nation-wide information utility.

This latter point was also taken up by Mr Da Silva in his paper on SAPONET, the South African public data switched network system. His department is working towards one uniform network system for South Africa that would link SAPONET to other related network systems such as BELTEL, various private Local Area Networks, other private videotext and teletext systems, i.e. the provision of a universal information network utility.

SAPONET already provides a gateway which connects South Africa to other data communication networks throughout the world. Mr Da Silva explicated the complexities of providing a data switching network system and indicated that SAPONET fully utilises the latest innovations in networking. The many advantages of packet switching, including inter alia multiple usage, ease of switching, greater efficiency and above all a fluid architecture, have all been incorporated into the SAPONET system.

Professor Kitzinger introduced the topic of Local Area Networks (LANS). He attributed their development to the general availability of microcomputers and the user's need to access information and data from his desk. The innovation of LANS was, furthermore, assisted by the integration of various technological applications such as text editing, facsimile transmission of text, computer dialogues and conferencing, which all required a new data transportation system.

The implementation of LANS could lead to relatively low cost end-user stations with high capacities and multiple function capabilities. Professor Kritzinger emphasized, however, that this ultimate objective could not be achieved without improved standardisation. We should strive towards compatability amongst equipment and standardisation to facilitate document formatting and interchange.

6. THE COMPUTERISATION PROCESS

Probably the most important aspect in organizing and managing the computerisation process is the selection of the correct system for a certain set of requirements. This requires an indepth evaluation of the proposed new system in terms of certain specified criteria.

Ms Lodder outlined four main steps that should be followed in such a mandatory evaluation process, viz:

(a) Specification of requirements, objectives and constraints of the system

(b) Selection of weighted evaluation criteria

(c) Information gathering

(d) Execution of the evaluation

She strongly emphasized that the most crucial step in the evaluation process is providing a logical and clearly written statement of the requirements specification, objectives and constraints of the system. It provides a clear mandate for systems installation and later serves as a project management tool according to which progress can be judged.

The success of the computerisation project can to a large extent depend on the thoroughness of the requirements specification. It should, therefore, be drawn up by a strong project team, representing all relevant interest groups, and realistically time scaled.

The selection of a computer system is normally followed by its implementation. Once again, according to Mr Stephenson, the requirements specification plays an important role. The implementation process is complex with many interacting participants. The project leader is the key element in the whole exercise and this requires a skilled project management approach. All the parties involved in the project, e.g. the users, the library, the vendor and local data processing personnel, should provide input under the skilled guidance of the project leader.

The points discussed and the caveats issued, relating to selecting and implementing a computerised system, were brought to a fore by Ms Sach's account of her experiences in analysing the information system requirements of a large oil company. It is imminently clear that such a study is rendered worthless unless goals, objectives and requirements are clearly specified. The user community should fully support and cooperate during such an exercise. Most important of all is that top management should be supportive and provide a clear mandate.

7. CONVERGENCE

The final case study very adequately drew together all the issues raised, discussed, and demonstrated during the workshop. It evoked lively discussion with most of the delegates making a contribution. The theme related to the computerisation of a fictitious pharmaceutical company's information service and the specification of requirements for such an exercise. The delegates gathered in groups and reported back to the general meeting summarising their deliberations.

The majority of the groups opted for an integrated system covering all library functions. Most groups preferred using the existing company computer facilities, half of them deciding to utilise the company's IBM mainframe computer and the other half selecting the company's minicomputers. Strangely very few groups considered a configuration that would network the mainframe to the various minicomputers in the remote centres. By implication the groups decided to purchase applications software rather than to develop their own.

A centralised system was envisaged by all with some sort of SABINET membership. Electronic mail facilities was mentioned by a few participants, while most groups indicated that they would access external databases for information retrieval purposes.

It is clear from the above that generally speaking the delegates had taken due cognizance of suggestions made by the various speakers on the implementation of computer applications to information systems. It was, furthermore, apparent throughout the

workshop that the technophobia of the 1970's has evolved into a healthy interest and determination to keep up to date with new developments in information technology.

The information era that we have entered has seen the convergence of many technologies all influencing information systems. It is fluid, dynamic and exciting, but extremely exacting. This requires improved, up-to-date skills, but even more so, an open-minded approach. It is, therefore, heartening to observe a discernable shift from an overt interest in technology to a more humanistic approach taking cognizance of user requirements.

Simultaneous with this shift from a technology driven to a user orientated system has come a realisation that information systems in the new era require improved organisational structures. We should move away from bureaucratic, monolithic organisational structures to decentralised, user friendly and service orientated systems. Prerequisites to such an approach are thorough systems analysis and a constant evaluation of services.

This greater awareness of the people we serve does not imply that we should ignore the new technology, but that we should intelligently apply it to enhance services and user/system interfaces. Innovations in information technology should be incorporated in our system, within a framework of our professional knowledge-base and a sound professional philosophy.

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VENDORS

The following is a list of vendors of software and suppliers of services which support library functions, all of whom are located in South Africa. This list makes no claim to being inclusive. Companies which exhibited at this workshop are indicated by asterisks.

*1. BELTEL. Department of Posts and Telecommunications, Stuttafords Building, Hout Street, Cape Town, 8000.
021-469 9111 x2337.
Contact: Dick Rorich.

2. BUSINESS OPERATING SOFTWARE. 196 Louis Botha Avenue, Houghton.
011-728 7362
Software: BOS; AUTO-INDEX

*3. COMPUTER SHOP. Ground Floor, Mobil House, Long Street, Cape Town 8001
021-217862.
Contact: Riaan Kruger.
Products: IBM Hardware and full range of peripherals
Software: Lotus 123, Multimate, DBAse III, etc.

4. CONTROL DATA SYSTEMS. P O Box 78105, Sandton, 2000.
011-783 5225
Contact: Thys Barker.
Software: Aladin, Basis.

5. DATA CYBERNETICS. 2301 Trust Bank Centre, Adderley Street, Cape Town 8001.
Contact: Michael Hohmann, Roland Von Hoesslin.
Software: Bookshelf.

6. DATA TECHNOLOGIES. P O Box 391738, Bramley, 2018
011-786 5380
Contact: Julie Schofield.
Software: Documaster.

7. DEST. 8th Floor, Management House, 38 Mella Street, Braamfontein 2001.
011-339 7441; 021 214785
Contact: Philip Wootton (Jhb); Graham (CPT).
Product: DEST Workless Station.

*8. DIMENSION DATA. P O Box 11154, Vlaeberg 8018
021-691904
Contact: Keith McLachlan
Products: Hayes Smart modem, Hayes Smartcom II, Dimension Data Smartlink.

*9. EBSCO SUBSCRIPTION SERVICES. P O Box 30633, Braamfontein 2017.
011-673 6830
Contact: W. Philip van Zwam
Software: Checkmate.

10. HEWLETT-PACKARD. P O Box 120, Howard Place, Pinelands.
012-537954
Contact: Gerrit van den Doon.
Software: EMILS

11. HINENI SERVICES. P O Box 59189, Kingray, Johannesburg 2000.
011-616 2238
Contact: Marius Rochon
Software: BRS Search, Hi-Search.

12. IBM SA (PTY) LTD. 45th Floor, Carlton Tower, Main street, Johannesburg 2001.
011-331 3385
Contact: Kevin Malone.
Software: STAIRS

13. IBM SA (PTY) LTD P O Box 1538, Pretoria 0001.
012-214 1911.
Contact: Joy van Eeden
Software: DOBIS/LIBIS

*14. INFORMATION SYSTEMS MANAGEMENT. P O Box 51012, Randburg 2153.
011-787 1142
Contact: Dr Boshoff
Software: Golden Retriever, Inmagic, Scimate, Libman, etc.

*15. KNOWLEDGE SYSTEMS INTERNATIONAL. P O Box 70074, Bryanston 2021.
011-642 4573
Contact: Arthur Davies, Sue Prowse.
Software: ORACLE

*16. MEDICAL RESEARCH COUNCIL. INSTITUTE FOR BIOMEDICAL COMMUNICATION.
(Was Institute of Medical Literature).
P O Box 70, Tygerberg, 7505
021- 932 0311
Contact: Dr Steve Rossouw, Dr Fred Saunders. Mr George Mulligan.

*17. NASHUA. Nashua House, 8 Vrede Street, Gardens 8001.
021- 453621
Contact Andre Breytenbach
Product: Nashuafax.

*18. NCR P O Box 896, Cape Town 8000
021-245030
Contact:Jimmy Sinton
Product: Interactive videodisc, barcoding.

19. PERSEUS COMPUTER SYSTEMS. P O Box 3986, Pretoria 0001
012-471156
Contact: Peter Prinsloo
Software: ALIS

*20. SABINET. 270 Main Street, Waterkloof 0180
012-484244/3. 012-496245/6
Contact: Philip Clarke, Ilse van Niekerk

*21. SACO SYSTEMS. P O Box 6147, Roggebaai 8012.
012-216693
Contact: Japie Griessel
Software: Circulation, barcoding.

*22. SAPONET. Room E704, 59 Commercial Street, Cape Town 8001
021-460340
Contact: Mr A da Silva

23. SOLUTIONS INTERNATIONAL CC. P O Box 70517, Bryanston 2021.
011-787 6664
Contact: Robin Piper
Software: CAIRS

*24. SPERRY. P O Box 4190, Cape Town 8000
021-216470
Contact: Ronnie Moore
Software: PAL

25. TELETEX. The Regional Director, Department of Posts and Telecommunications, P O Box 9200, Cape Town 8000
021-469 2063. OR Mrs A Vurovecz, Siemens, P O Box 3350, Pretoria, 0001
012-286477.

26. TELETEXT/TELEDATA. SABC.
012 286477
Contact: Tim Robson, SABC, Teledata and Regional Services News.

*27. URICA INTEGRATED SYSTEMS P O Box 51571, Randburg, 2125.
011-787 0520
Contact: Kerry Stephenson, John Cormack.
Software: URICA

*28. VIDEO COMMUNICATION SYSTEMS. 70 Wale Street, Cape Town 8001.
021-241677; 021 230069.
Contact: Mr R Preger, Gilbert Mamet.
Product: Thomson overhead projectors, etc.

COMPUTER APPLICATIONS IN INFORMATION SYSTEMS

26-27 NOVEMBER 1985

FINAL PROGRAMME

TUESDAY 26 NOVEMBER

08:00 Registration and coffee

08:15 Announcements. Mrs Sheila Hunt, Old Mutual Management Library.

08:20 Welcome. Prof. JG Kesting, Director, UCT School of Librarianship.

08:40 Introduction to the use of information technology. Ms Sue Myburgh, Lecturer, UCT School of Librarianship.

09:00 Searching remote databases. Dr Steve Rossouw, Director, MRC Institute of Medical Literature.

09:45 SABINET. Decription and developments. Ms Ilse van Niekerk, Head, Research and Development, SABINET.

10:25 Tea

10:45 Introduction to integrated library systems. Ms Margaret Lodder, Director, Library Services, CSIR.

11:00 Demonstration of an integrated library system: URICA. Acquisitions, cataloguing and circulation subsystems. Mr Kerry Stephenson, Information Systems Manager. URICA.

12:00 Serials Control. Mr W Philip van Zwam. Regional Manager, EBSCO.

12:30 Lunch (with cash bar). Informal discussions and demonstrations.

14:00 Introduction to software packages. Ms Margaret Lodder, Director, Library Services, CSIR.

14:30 Building your own database. Ms Yvonne Blomkamp, Information Officer, Energy Research Institute, UCT.

15:00 Information retrieval in the creation of databases. Mr Johan van Wyk, Lecturer, Department of Library and Information Science, RAU.

15:30 Final announcements. Mrs Sheila Hunt, Old Mutual Management Library.

15:35 Tea. Discussion and demonstrations.

WEDNESDAY 27 NOVEMBER

08:15 Coffee

08:40 Applications of telecommunications and networking. Ms Sue Mydurgh, Lecturer, UCT School of Librariansnip.

09:00 SAPUNET. Description and developments. Mr. T da Silva, Deputy Director, SAPUNET.

09:30 LANS - Local Area Networks. Prof. Pieter Kritzinger, Dept. of Computer Science, UCT.

10:00 Tea

10:30 The computerization process: choosing a computerized system. Ms Margaret Lodder, Director, Library Services, CSIR.

11:15 Implementation of a computerized system. Mr Kerry Stephenson, Information Systems Manager, URICA.

12:00 Strategy for development - a personal account. Ms Marlene Secns, Information officer, Mobil Oil SA.

12:30 Case Study. Ms Margaret Lodder, Director, Library Services, CSIR.

13:00 Working lunch (with cash bar)

14:30 Report Back. Ms Margaret Lodder and Mr Kerry Stephenson.

15:30 Closing comments. Mrs Gretchen Smith, Senior Lecturer, UCT School of Librariansnip.

16:45 Tea. Final demonstrations.

BIBLIOGRAPHIES

The following bibliographies select a few relevant items from the enormous amount of literature on the subject.

1. INTRODUCTION TO COMPUTER TECHNOLOGY

Burton, P F and J H Petrie. Introducing microcomputers : a guide for librarians Wokingham : Von Nostrand Reinhold, 1984

Changing information concepts and technologies : a reader for the professional librarian White Plains, N.Y. : Knowledge Industry Publications (KIP), 1982

Fosdick, Howard Computer basics for librarians and information scientists Arlington, VA : Information Resources Press, 1981

Microcomputers in libraries. Edited by Ching-chih Chen and Stacey E Bressler New York : Neal Schuman, 1982

New information technologies : new opportunities Edited by Linda C Smith Illinois : Graduate School of Library and Information Science, 1982

Perspectives : introduction to computer technology In: Journal of the American Society for Information Science, March 1981

The professional librarian's reader in library automation and technology Introduction by Susan K Martin White Plains, N.Y. : KIP, 1980

Shelly, Gary B and Thomas J Cashman Introduction to computers and data processing. Fullerton (CA) : Anaheim, 1980

Tedd, L A Introduction to computer-based library systems London : Heyden, 1977

Walsh, Myles E Understanding computers : what managers and users need to know New York : John Wiley, 1981

2: TELECOMMUNICATIONS

Annual Review of Information Science and Technology. This serial publication provides updates on the newest developments, as well as providing an overview of the most recently published literature on the subject.

New information technologies : new opportunities. Edited by Linda C Smith Illinois : Graduate School of Library and Information Science, 1982

The professional librarian's reader in library automation and technology Introduction by Susan K Martin White Plains. N.Y. : KIP, 1980

Telecommunications and networking : proceedings of the 14th ASIS mid-year meeting at Fort Lauderdale, Florida, May 19-22, 1985. Washing ton : ASIS, 1985

3 : INFORMATION TECHNOLOGY

Bell, Daniel The coming of the post-industrial society New York : Basic Books, 1976 (2nd ed.)

Bell, Daniel Teletext and technology : new networks of knowledge and information in the post-industrial society In: Encounter 48(6):9-29

Dougherty, Richard M and Wendy P Lougee What will survive? : as electronic publishing evolves, and libraries adapt to it In: Library Journal, Feb 1, 1985:41-44

Hlava, Marjorie, M K State of the Art 1985 : Special libraries/online technologies In: Special libraries, Spring 1985:121-125

Libraries in the post-industrial society Edited by Leigh Estabrook Phoenix (AZ) : Oryx Press, 1977

Sigel, Efrem; Mark Schubin, Paul F Merrill Videodiscs : the technology, the applications and the future New York; London : Van Nostrand Reinhold, (1983?)

Spencer, John R Holographic applications to information handling In: Reprographics Quarterly, Vol 9 (1):11-14

Sturm, Rebecca High tech breakthrough : interactive videodisc In: Wilson Library Bulletin, March 1985:450-452

Zorkoczy, Peter Information technology : an introduction London : Pitman, 1982

4 : REMOTE DATABASES AND ONLINE SEARCHING

Journals

The electronic library
Information technology and libraries
Library Journal
Library resources and technical services
Library technology reports
Online
Online review
Program : news of computers in libraries

Online and Online review are particularly important in this subject area. Once a year an extensive bibliography is published in Online review (in August). This covers books, directories, reviews, conference proceedings, descriptions of online systems, databases and services, equipment, applications and so on - much of interest. OR also publishes annually an International comparative price guide to databases online.

Monographs:

Henry, W M et al. Online searching : an introduction London : Butterworths, 1980

Hoover, R E The library and information manager's guide to online services White Plains, N.Y. : KIP, 1980

Meadows, C T and Cochrane, Pauline Basics of online searching New York : Wiley, 1981

5 : COMPUTER SYSTEMS AND THEIR IMPLEMENTATION

Journals

BYTE
Computer world
Database : magazine of database reference and review
Datamation
Edpacs : the EDP audit, control and security newsletter
The electronic library
Information technology and libraries
Library Journal
Library technology reports
Online
Online review

Monographs

Boss, Richard W The library manager's guide to automation White Plains, N.Y. : KIP, 1984

Burton, P F and J H Petrie Introducing microcomputers : a guide for librarians Wokingham : Van Nostrand Reinhold, 1984

Carter, Keith C and Scott Bruntjen Data conversion White Plains, N.Y. : KIP, 1983

Cline, Hugh F, Loraine T Sinnott The electronic library : the impact of automation on academic libraries Lexington, Mass. : Lexington Books, 1983

De Gennaro, Richard Integrated library systems : perspectives, perceptions and practicalities In: Library Journal, Feb 1, 1985:37-41

Epstein, Susan Baerg A series of articles on evaluation and implementation In: Library Journal, from 1982 - present

Genaway, David C Integrated online library systems : principles, planning and implementation White Plains, N.Y. : KIP, 1984

Hanson, Debbie A microcomputer security procedures manual In: Edpacs, Vol 12 (10):1-10, 1985

James E Rush and Associates. This consultancy group has produced/is producing a splendid 8 volume work which describes various functions of serials control, cataloguing, acquisitions, etc., how to assess the functional needs of each of these, gives data definition and requirements, and comprehensively lists suppliers.

Levert, Virginia Applications of Local Area Networks of microcomputers in libraries In: Information technology and libraries, March 1985:9-18

Maliniconico, S Michael and Paul J Fasana The future of the catalogue : the library's choices White Plains, N.Y. : KIP, 1979

Matthews, Joseph R Choosing an automated library system : a planning guide 2nd ed. Chicago : ALA, 1984

Matthews, Joseph R and Joan Faye Williams Oh, if I'd only known : ten things you can do today to prepare for library automation tomorrow In: American libraries, June 1983:408-412

Matthews, Joseph R Unrelenting change : the 1984 automated library system marketplace In: Library Journal, April 1, 1985:31-40

Microcomputers in libraries Edited by Ching-chih Chen, Stacey E Bressler New York : Neal-Schuman, 1982

Powell, James R and June E Slach How to evaluate integrated library automation systems In: Online, March 1985:30-36

A reader in choosing an automated library system Edited by Joseph R Matthews Chicago : ALA, 1983

Rorvig, Mark E Microcomputers and libraries : a guide to technology, products and applications White Plains, N.Y. : KIP, 1981

6 : SOME REFERENCE WORKS

Computers and computing information resources directory Edited by Martin Connors, Detroit : Gale, 1985

Encyclopaedia of information systems and services 6th ed. Edited by John Schmitroth Detroit : Gale, 1985

Information professionals directory Edited by Janet Shuter Kings Ripton,: Elm Publications, 1984

Marquis Who's who directory of online professionals Chicago : Marquis, 1985. This work was statistcally analysed in Online, July 1985:15-27

Pritchard, Alan A guide to computer literature : an introductory survey of the sources of information 2nd ed, rev. and expanded London : Bibgley, 1972

Telecommunications systems and services directory 2nd ed. Edited by Martin Connors Detroit : Gale, 1985

GLOSSARY

Acoustic coupler	A device that converts electrical signals into audio signals (i.e. digital into analog)
Add-on	Equipment that supplements a computer's memory or performance
Algorithm	A prescribed set of well-defined rules or processes for the solution of a problems in a finite number of steps.
Alphanumeric	A chracter set that contains letters, digits, and possibly other characters.
Analog	A continuously varying quantity, like temperature or time. cf digital
ANSI	American National Standards Institute.
Answerback	The response of a computer to remotely transmitted signals
ASCII	American National Standard Code for Information Interchange; characters comprise seven bits (eight bits, with control digit); a standard used for the communication and processing of data.
Assembler	A program that translates assembly language into the computer's language
Assembly language	A low-level language that is similiar to the computer's language but is slightly easier for humans to use. Uses mnemonics.
Asynchronous transmission.	Transmission in which individual characters are synchronized, by being encapsulated in stop and start bits.
Auto-answer	The capability of a terminal, modem or computer to respond automatically to an incoming call.
Auxiliary storage	Data storage other than main storage, eg magnetic tape or disc drives
Bandwidth	The difference between the highest and lowest frequencies of a transmission channel. This is expressed in Hertz (Hz).
BASIC	Beginners' All Symbolic Instruction Code
Batch processing	A type of data processing in which a group of similiar tasks is executed in a batch, rather than one by one. cf Interactive.
Baud	A measure of the speed of transmission of data. One baud equals one bit per second. 300 baud = 30 characters sent per second; 1200 baud = 120 characters per second, etc.
Binary code	A code that makes use of exactly two distinct characters, usually 0 and 1; a base-two system (as opposed to decimal which is base 10).
Bit	A contraction of binary digit. It is the smallest unit of information in a binary system, and is usually represented by zero and one.
Bug	A term for an error or problem. A software bug prevents the program from running successfully or attaining its goal. Harware bugs are malfunctions in equipment.
Bus	The route taken by information being transferred within a computer. Also referred to as channel, line or trunk.
Byte	The representation of a character, a common representation being 8 binary digits, equalling

one byte, which equals one character.

Cathode ray tube (CRT) An electronic vacuum tube similiar to a television screen; usually phosphur.

Central processing unit (CPU). The internal part of a computer which controls its operation.

Character — The actual or coded representation of a letter number of punctuation mark. Used synonymously with byte.

Character code — One of several standard sets of binary representations for the alphabet, numerals etc., such as ASCII and EBCDIC.

Character string — A continous sequence of alphnumeric characters which may constitute part or all of a word, phrase or sentence.

Chip — A small piece of material, usually silicon, which contains electronic circuit elements

COBOL — Common Business-Oriented Language

Code — Information written in computer readable form

Command — A request entered by a user at the terminal for the execution by the computer of a specific operation

Compiler — A program that translates one computer language into another

Computer program — A series of instructions or statements in a form acceptable to a computer, that causes the computer to process a specific job. (The program must be in a specifi machine language. Programmers normally use higher level languages eg BASIC which must be translated by compilers and assemblers into machine language.)

Computer system — A central processing unit with main storage, input/output channels, control units, direct access storage devices, and input/output devices.

Configuration — A unique combination of computer system components with an identifiable set of capabilities. Often marketed as a model, comparable to a model of a car.

Connect time — The time that a user is linked to a remote computer system. This is the duration between sign-on (logon) and sign-off (logoff).

CP/M — Control Program for Microcomputers; a microcomputer operating system that has become a de facto industry standard primarily for 8-bit microprocessor-based computers.

Cursor — A movable indicator such as an illuminated arrow or blinking underline character on the screen of a CRT terminal

Data — Digitally represented information which includes voice, text, facsimile, and video; numeric, alphabetic or special characters; when grouped together in a meaningful way data becomes information

Data element — A unit of information that is all or part of a field in a record.

Data processing — The adding, subtracting and comparing functions, and variations on this

Database — A systematic integrated collection of data files

DBMS — Database management system. A program designed to structure information to facilitate storage and retrieval

Dedicated line — A communication or power line that is dedicated to one function of one piece of equipment

Demodulation	The changing of a signal from analog to digital mode
Dial-up	The capability of establishing a temporary connection via the telephone network.
Digital	Where information is represented in binary one or zero, that is, discrete rather than continously varying
Disk	A circular piece of magnetically coated material on which information can be recorded and stored; floppy or hard; the former are also known as diskettes.
Disk pack	A removalbe direct access storage volume containing magnetic disks on which data is stored. These packs are mounted on a disk storage drive.
Distributed databases	A situation in a network in which a database is distributed according to application requirements among several locations
Distrsibuted processing	A situation in a network where computer processing takes place in several locations that are linked together electronically and/or by telecommunications
Distributed system	A type of network where computers, files and/or databases are distributed amonst several locations
Dot matrix	Characters on a CRT screen or printer that are represented by dots within a predetermined matrix, or grouping of dot positions.
Downtime	The time during which a computer or telecommmunications network resources have failed and cannot be used.
EBCDIC	Extended Binary Coded Decimal Interchange Code
Facsimile	Means by which documents (graphics or text) may be scanned by special equipment and transmitted via the telephone network.
Field	One or more data elements that form a logical unti; eg in a bibliographic record the author name constitutes a field, the title another, etc.
File	An organized collection of related records
Firmware	A type of software which has been made part of the computer. It cannot be changed by the user, and therefore is similiar in this respect to hardware.
FORTRAN	Formula Translation
Function key	A terminal key that instructs the computer to perform some pre-determined function
Giga (G)	Prefix meaning one billion
Hardcopy	A printed copy of machine output in visually readable form
Hardware	Physical data processing equipment, as opposed to programs or methods of use
High-level language	Any programming language resembling natural language, eg BASIC
Information retrieval system	A computing system application designed to recover specific information from a mass of data
Input	Information fed into the computer
Intelligent terminal	A terminal that is programmable and which is capable of performing processing functions independent of the central computer

Interactive	Where the computer may respond to the user's commands, and a conversation-type interchange is established
Interface	A physical point of demarcattion of boundary between two devices, or between a device and a human
I/O	Input/output
Keyboard	A device which resembles a typewriter, which is used for encoding data by pressing keys. May additionally have function keys and a numeric pad.
LAN	Local Area Network
Language	A standardized set of instructions that allows a user to create a program to direct the operations of a computer
m	milli - designation for one thousandth
M	mega - designation for one million
Machine language	A set of binary codes which can be directly executed by a computer; computer language
Mainframe	A large computer including the CPU, memory and peripheral interfaces (largest and fastest of the range)
MARC	Machine-Readable Cataloguing
MARC Format	A format used to facilitate the communication and exchange of machine-readable records. Different MARC formats exist for different countries and different types of materials
Megabyte (Mb)	1 048 576 bytes, equal to 1 024 Kbytes, basic unit of measurement of mass storage
Memory	A device used for the storage of data and instructions. May be in the computer itself or in peripheral equipment
Menu	A list of options from which the user may select the next task for the computer to execute
Microsecond	One Millionth of a second
Millisecond	One thousandth of a second
Mnemonic	A symbol chosen to assist human memory
Modem	A contraction of modulator/demodulator; electronic device that enables digital data to be sent over analog transmission facilities
Monitor	A television set that has been adapted to receive signals directly from a computer
Nanosecond	One billionth of a second
Network	An interconnected group of nodes; a series of points, nodes or stations connected by communications channels
Node	A device that allows for the transmission of data within a network
Noise	Unwanted disturbances that occur during communication of data
OCR	Optical Character Recognition; the process of reading chracters using light-sensitive devices which convert the characters into machine-readable digital codes
Offline	Condition in which a user, terminal or other device is not connected to a computer, or is not actively transmitting via a network
Online	Condition in which a user, terminal or other device is actively connected with the facilities of a communications network or computer
OPAC	Online Public Access Catalogue

Operating System (OS)	The software of a computer that acontrols the execution of programs, typically handling the function of I/O control, resource scheduling, and data management (eg CP/M)
Output	The transfer of data from within the computer to external devices such as screens or printers
Picosecond	One trillionth of a second; one millionth of a microsecond
Pixel	Picture element; smallest unit of a graphics or video display
Port	The point of access into a computer or network; the physical or electrical interface through which one gains access
Program	A series of instructions to the computer which enable it to perform certain functions or operations
PROM	Programmable Read-Only Memory
Prompting	Computer messages to the user that encourage the next user command
Protocol	Formal set of rules which enables communication between databases
RAM	Random Access Memory
Real-time	A transmission or data processing operating mode where data is entered in an interactive session, the results of the operation being available within seconds of entry of the command
Response time	The time between the end of a user enquiry and the begin4ing of the computer response in interactive mode
ROM	Read Only Memory
Software	The collection of control programs used to make a c computer run; including OS, compliers, assemblers, and utility programs; also application programs
Telecommunications	The transmission of signals over long distances, such as telegraph, radio, telephone, microwave
Teletex	Higher-speed version of telex
Teletext	One-way data transmission designed for broadcasting of graphics and textual information, for display only on subscriber televisions. More limited than videotext, where selection may be made from pages of information
Terminal	A point in a network at which data can either enter or leave.
Time-sharing	A method of permitting several users to interact simultaneously with a computer system
Turnkey system	A system that can be delivered to a library with little or no modifications and is ready to operate
Uptime	Uninterrupted time that a networkd or computer resources are accessible and available
User-friendly	Easily interactive with users
Utility programs	Perform tasks routinely required by users, eg sorting data into a sequence
VAN	Value-Added Network
Videotex	Interactive data transmission which allows users to perform transactions and retrieve textual and graphics information on subscriber televisions
VDU	Visual Display Unit
Winchester disk	A hard-disk system
Word processing	A program for storage and editing of text.